ABSTRACT
        Because of the high incidence of failure in algebra I
among ninth-grade students, the Louisiana State Board of Elementary
and Secondary Education requested the development of this guide with
the intention of providing a good pre-algebra foundation. The
purposes of the guide are to recognize standards that involve the
application of mathematical rules to algebraic concepts and to
provide the introduction of elementary algebra skills. Topic areas
include: (1) "Whole Numbers"; (2) "Decimals"; (3) "Number Theory";
(4) "Fractions"; (5) "Ratio, Proportion, Percent"; (6) "Integers,
Rational Numbers, Real Numbers"; (7) "Elementary Algebra"; (8)
"Linear Equations and Inequalities of One Variable"; (9) "Probability
and Statistics"; and (10) "Geometry." The curriculum outline and its
performance objectives are listed. Activities, activity answer keys,
and evaluation techniques are listed for each objective. A
bibliography, and listings of state-approved textbooks for grade 8,
and supplements, are included. Materials about terminology, subsets
of real numbers, extracting square root, problem solving strategies,
and polygon activity are appended. (YP)

STATE OF LOUISIANA
DEPARTMENT OF EDUCATION

INTRODUCTION TO ALGEBRA
CURRICULUM GUIDE
Grade 8

Bulletin 1802
**1987**

THOMAS G. CLAUSEN, Ph.D.
State Superintendent

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STATE OF LOUISIANA

DEPARTMENT OF EDUCATION

INTRODUCTION TO ALGEBRA
CURRICULUM GUIDE

Grade 8

Bulletin 1802

1987

Issued by

Office of Academic Programs

Thomas G. Clausen, Ph.D.
Superintendent

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Curriculum guides have been developed for grades K-8 at the elementary level and for each mathematics course at the secondary level. These guides represent the best thinking of a selected statewide committee established to determine the scope of mathematics content which should be taught at each level.

The mathematics curriculum guides are another segment of the total educational program mandated by the Legislature in both the account-ability and assessment and the competency-based education laws. This educational program requires that specific skills and concepts be established for each grade level and for each subject area. The mathematics curriculum guides with course outlines, performance objectives and coordinated activities effect this phase of the pro-gram.

It is hoped that the mathematics curriculum guides will make a major contribution to the improvement of mathematics instruction in the schools of Louisiana.

Thomas G. Clausen
Thomas G. Clausen, Ph.D.

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INTRODUCTION

The Louisiana State Board of Elementary and Secondary Education in May, 1984, mandated changes in mathematics graduation requirements for all students, effective with incoming freshmen beginning with the 1985-86 school session. The mathematics curriculum required of all high school students must include Algebra I, Algebra II and Geometry, or Algebra II or Geometry and one of the following: Advanced Mathematics, Calculus, Consumer Mathematics, or Business Mathematics.

Because of the high incidence of failure in Algebra I among ninth grade students, the State Board in July, 1986, requested that the Department develop an Introduction to Algebra Curriculum Guide for the expressed purpose of providing eighth grade students with a good pre-algebra foundation. This guide has been developed by a representative group of mathematics teachers and supervisors, working under the direction of Departmental mathematics and curriculum staff members. The course was piloted during the second semester of the 1986-87 school session and revised during the summer of 1987. Beginning in 1988-89, Introduction to Algebra is required in grade eight as the mathematics curriculum for academically able students in mathematics.

RATIONALE

The purpose for the development of the Introduction to Algebra guide is two-fold:

- To recognize standards that involve the application of mathematical "rules" to algebraic concepts.
- To recognize that, in order for students to exit the eighth grade ready for Algebra I, the introduction of elementary algebra skills is necessary.

It is further intended that this guide is to provide concentration on the expansion of skills relative to algebra, geometry, statistics, probability, and problem solving for the more <u>mathematically mature eighth grade student</u>. In carrying out this intent, the goal of this committee, as charged by the Board of Elementary and Secondary Education, is to develop a program that will assure the strong mathematical foundation which students must acquire before entering Algebra I in the years beyond 1986-87.

Finally, the committee recognizes that this guide is a blueprint of eighth grade mastery skills and elementary algebra skills. The sequencing of these skills is left to the discretion of the instructor.

GOALS

Upon completion of Introduction to Algebra, the student will be able to:

1. Perform operations with rational numbers and percent.

2. Recognize and use the properties of real numbers, the symbols of mathematics, and the language of algebra.

3. Develop an understanding of elementary algebra, including number theory and operations on polynomials (monomials).

4. Solve linear equations and inequalities of one variable and graph their solutions.

5. Demonstrate an understanding of probability and statistics.

6. Demonstrate a basic knowledge of coordinate geometry.

7. Prove a working knowledge of formulas.

8. Show a strengthened mathematical background and preparedness for algebra.

PACING CHART

The following pacing chart contains suggested periods of time to devote to each major topic in this curriculum guide. Because students learn at different rates and available teaching time during the school year is affected by many other variables, this pacing chart is based on thirty weeks of school. The remaining six weeks may be used as the teacher thinks best. Ample optional and supplementary materials are included for enrichment.

	TOPIC	NUMBER OF DAYS
I.	Whole Numbers.	2
II.	Decimals	3
III.	Number Theory.	10
IV.	Fractions.	10
V.	Ratio, Percent, Proportion	15
VI.	Integers, Rational Numbers, Real Numbers	25
VII.	Elementary Algebra	10
VIII.	Linear Equations and Inequalities of One Variable.	40
IX.	Probability and Statistics	10
X.	Geometry	25
		150

CURRICULUM OUTLINE AND PERFORMANCE OBJECTIVES

I. Whole Numbers
    A. As outlined in the 1986
        revised edition of the
        Louisiana Department of
        Education Mathematics
        Curriculum Guide, K-8,
        operations on whole
        numbers should have been
        mastered prior to grade
        eight. (Review as
        needed.)[1]

    B.[2] Problem solving   The student will be able
                                              to solve appropriate word
                                              problems involving the
                                              addition and subtraction
                                              of measurements of:

        1. Length   1. Length using cus-
                                                  tomary system
                                                  (inches, feet, yards)
                                                  and the metric (SI)
                                                  system (meters, cen-
                                                  timeters).

        2. Weight   2. Weight using the
                                                  customary system
                                                  (ounces, pounds) and
                                                  metric (SI) system
                                                  (kilograms, grams).

        3. Capacity   3. Capacity using the
                                                  customary system (cups,
                                                  pints, quarts, half
                                                  gallons, gallons) and
                                                  metric (SI) system
                                                  (liters, milliliters).

II. Decimals

    A. As outlined in the 1986
        revised edition of the
        Louisiana Department of
        Education Mathematics
        Curriculum Guide, K-8, oper-
        ations involving decimals
        should have been mastered
        prior to grade eight.
        (Review as needed.)[1]

[1] Review material has been provided in the activity section.
[2] Eighth grade mastery skill

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
II. B.[1] Decimal equivalent	B. The student will be able to identify decimal numbers equivalent to: 1. Common fractions 2. Mixed numbers
C. Problem solving	C. Solve appropriate word problems involving the use of money in everyday life situations.
III. Number theory	To demonstrate an understanding of number theory, the student will be able to:
A. Divisibility tests	A. Recognize numbers that are (evenly) divisible by two, three, four, five, six, nine, and ten.
B. Prime factors	B. 1. Define and identify prime and composite numbers. 2. Identify the factors and prime factors of a number between 1 and 100. 3. Write a number as the product of its prime factors (17 or less).
C. Exponents	C. 1. Define and identify bases and exponents. 2. Write the exponential form of a power of ten given in standard form (e.g., express 100 as 10^2 or 1000 as 10^3).[1] 3. Extract the square root of a number that is a perfect square such as $\sqrt{25}$. 4. Write the standard form of a number given in exponential form, including zero as an exponent (e.g., express 6^3 as 216).[1]

[1]Eighth grade mastery skill

III. C. Exponents

5. Identify factored form and exponential form in addition to writing a product of a variable as a power of that variable (e.g., express $x \cdot x \cdot x$ as x^3).

D. Greatest common factor (GCF)

D. Use prime factors to determine the greatest common factor of two or more numbers.

E. Least common multiple (LCM)

E. Use prime factors to determine the least common multiple of two or more numbers.

F. Scientific notation

F. 1. Express numbers in scientific notation (e.g., express 6000 as 6×10^3).

2. Interpret numbers given in scientific notation (e.g., read 6×10^3 as 6000).

G. Order of operations
1. With exponents and without grouping symbols.
2. With exponents and with grouping symbols.

G. Perform multiple operations
1. With exponents and without grouping symbols, such as $5 \cdot 6^2 + 4^3 \div 2 - 8$.
2. With exponents and with grouping symbols, such as $5 \cdot (6^2 + 4^3) \div 2 - 8$.

IV. Fractions

A. As outlined in the 1986 revised edition of the Louisiana Department of Education Mathematics Curriculum Guide, K-8, operations involving fractions should have been mastered prior to grade eight. (Review as needed.)[1]

B.[2] Multiplication

B. The student will be able to remove factors from numerator and denominator before multiplying (cancellation).

[1]Review material has been included in the activity section.
[2]Eighth grade mastery skill

IV. C.   Problem solving

C.   The student will be able to solve appropriate word problems involving the use of money in everyday life situations.

V.   Ratio, proportion, percent

To demonstrate an understanding of the operations, the student will be able to:

   A.   Ratio

A.   Write ratios as fractions.

   B.   Proportion

B.   1.   Identify equivalent ratios as proportions.[1]
      2.   Define and identify the parts (terms) of a proportion: means and extremes.
      3.   Solve for the missing term of a proportion (e.g., 1:2= __:4 and

$$\frac{1}{2} = \frac{x}{4}).$$

   C.   Percent

C.   1.   Change proper and improper fractions or mixed numbers to percents.[1]
      2.   Change a percent to a decimal number.
      3.   Change a percent to a fraction in lowest terms.
      4.   Find the percent of increase or decrease.[1]
      5.   Use percentages less than one percent.[1]
      6.   Solve the three types of percent problems: finding rate, base, and percentage.
      7.   Distinguish between simple and compound interest.[1]
      8.   Define straight salary and commission.[1]

   D.   Problem solving with application

D.   Solve appropriate word problems involving
      1.   The computation of simple interest.[1]
      2.   The computation of price and sale price, tax, discount, and rate of discount.[1]

[1]Eighth grade mastery skill.

VI. Integers, rational numbers,   To develop an understanding
     and real numbers   of integers, rational numbers,
                                           and real numbers, the student
                                           will be able to:

     A. Terminology   A. Define and identify
                                               1. Natural numbers
                                               2. Whole numbers
                                               3. Integers
                                               4. Rational numbers
                                               5. Irrational numbers
                                               6. Real numbers

     B. Construction   B. Construct a number line
                                               and
         1. Coordinate of a   1. Identify the coordinate
             point   of a point.
         2. Assign a number.   2. Plot a designated
                                                   point.

     C. Subsets   C. Diagram the subsets of
                                               the real number system.

     D. Graphs of subsets   D. On separate number lines,
                                               graph the various subsets
                                               of the real numbers.

     E. Absolute value   E. Define and determine the
                                               absolute value of any
                                               real number.

     F. Operations   F. Perform the operations of
                                               1. Addition, subtraction,
                                                   multiplication and
                                                   division of integers.
                                               2. Addition, subtraction,
                                                   multiplication and
                                                   division of rational
                                                   numbers.

     G. Order of operations   G. Apply the rules for order
                                               of operations when per-
                                               forming multiple operations
                                               on real numbers, with or
                                               without grouping symbols.

     H. Properties   H. Recognize and use
                                               *1. Closure properties
                                                2. Commutative properties

*All items are mandatory unless preceded by an asterisk.
 Items with an asterisk should be taught if time permits.

VI. H. Properties

                                                   3. Associative properties
      4. Additive identity properties
      5. Multiplicative identity properties
      6. Additive inverse
      7. Multiplicative inverse (reciprocal)
      8. Distributive property
      9. Multiplicative property of 0
     10. Property of substitution

I. Problem solving and application

I. Solve appropriate word problems involving the use of operations with real numbers.

VII. Elementary algebra (Because the basic eighth grade text does not address these concepts, supplemental material has been provided.)

To demonstrate an understanding of the elementary Algebra concepts, the student will be able to:

A. Evaluate expressions

A. Evaluate an algebraic expression given a replacement set for the variable(s), using the property of substitution.

B. Operations on polynomials

     1. Combine like terms.

B. Perform operations on polynomials.
     1. a) Define the term monomial.
        b) Define and identify like terms.
        c) Define binomial, trinomial, polynomial.
        d) Add and subtract polynomials (monomials, binomials, trinomials).

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
VII. B. 2. Multiplication of monomials	2. Multiply two or more monomials.
3. Multiplication of a polynomial by a monomial	3. Multiply a polynomial by a monomial. (Distributive Property)
4. Divide monomials	4. Divide a monomial by a monomial
C. Factoring monomials	C. Use prime factors to determine the GCF and/or LCM of two or more monomials such as $10a^2b$ and $15ab^2$.
VIII. Linear equations and inequalities of one variable	To demonstrate an understanding of linear equations, the student will be able to:
A. Terminology	A. Define these terms: 1. Equation 2. Open sentence 3. Replacement set 4. Root 5. Solution set 6. Linear equation 7. Reflexive property 8. Symmetric property 9. Transitive property
B. Solutions of linear equations in one variable	B. 1. Solve equations using these properties of equality: a) Addition b) Subtraction c) Multiplication d) Division 2. Solve equations involving more than one operation. 3. Show the solution of a linear equation on a number line. 4. Solve equations having variables on both sides.

VIII. C   Graphing

    1.   Terminology   C.   1.   Define these terms:
- a) Rectangular coordinate system
- b) Ordered pair
- c) Horizontal and vertical axis
- d) Origin
- e) Quadrants
- f) Abscissa
- g) Ordinate

    2.   Location of points using the rectangular coordinate system   2.   Locate and relate points in the plane to ordered pairs of numbers.

    3.   Linear equations   3.   Solve and graph linear equations in two variables using the rectangular coordinate system.

D.   Problem solving   D.   1.   Translate verbal expressions to algebraic expressions and vice versa.

                                           *2.   Use linear equations to solve word problems involving number relations such as number, consecutive integer, geometry, distance, coin, and age problems.

E.   Solutions of linear inequalities in one variable   E.   1.   Find the solution set of a linear inequality in one variable.

                                           2.   Graph the solution set of a linear inequality in one variable.

*All items are mandatory unless preceded by an asterisk.
 Items with an asterisk should be taught if time permits.

IX. Probability and statistics

To demonstrate an understanding of probability and statistics, the student will be able to:

A. Graphs

A. 1. Interpret information presented in maps, charts, and tables.
    2. Construct, interpret, and use data from pictographs, bar graphs, circle graphs, and line graphs.

B. Probability[1]

B. 1. Find the probability involved in a coin toss, the roll of a die, a turn of a spinner, or a draw of marbles or cards.
    2. Interpret probability statements encountered in everyday situations.

C. Statistics[1]

C. Find the mean, mode, median, and range of a set of data.

D. Problem solving[1]

D. Solve appropriate word problems and critical thinking problems involving graphs, probability, and statistics.

[1]Eighth grade mastery skill

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES

X.   Geometry

To demonstrate an understanding of geometry, the student will be able to:

    A.   Terminology

A.   Identify
1.   The terms and symbols (where applicable)
    a)   Point
    b)   Line
    c)   Ray
    d)   Line segment
    e)   Plane
    f)   Angle
    g)   Adjacent angles
    h)   Complimentary angles
    i)   Supplementary angles
    j)   Vertical angles
    k)   Parallel lines
    l)   Perpendicular lines
    m)   Transversal
    n)   Corresponding angles
    o)   Alternate interior and exterior angles
    p)   Circle
    q)   Polygon
    r)   Triangle
    s)   Quadrilateral

    B.   Angles

B.   1.   Define and classify angles as acute, obtuse, right, or straight.
2.   Identify congruent angles.
3.   Recognize that the sum of the measures of the interior angles of a triangle is 180°.
4.   Measure and draw angles using a protractor (up to 180°).
5.   Construct an angle using a straight edge and compass.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES

C.   Circles[1]

D.   Polygons

    1.   Regular

C.   1.   Identify[1] the
    a) Center.
    b) Radius.
    c) Diameter.
    d) Circumference.
    e) Semi-circle.
    f) Chord.
    g) Arc.
    h) Central angle.

2.   Recognize and use π in fractional ($\pi \approx \frac{22}{7}$) or decimal ($\pi \approx 3.14$) form.

3.   Determine the area and circumference of a circle.

D.   1.   a) Define a regular polygon.

    b) Identify and classify 3 – 10 sided polygons.

[1]Eighth grade mastery skill

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
X. D. 2. Irregular	2. a) Define an irregular polygon b) Construct irregular polygons
E. Triangles[1]	E. 1. Identify the altitude and base of a triangle. 2. Classify triangles according to sides (scalene, isosceles, equilateral). 3. Classify triangles according to their angles (acute, right, obtuse). 4. Identify the parts of a right triangle (hypotenuse, legs). 5. Determine the area of a triangle.[1] 6. Use the Pythagorean rule.[1]

F. Quadrilaterals	F. 1. Identify a
	  a) Square.
	  b) Rectangle.
	  c) Trapezoid.
	  d) Parallelogram.
	  e) Rhombus.
	2. Identify the altitude and base(s) of a trapezoid and parallelogram.
	3. Determine the area of a
	  a) Square.
	  b) Rectangle.
	  c) Parallelogram.[1]
	  d) Trapezoid.

G. Similar and Congruent Figures	G. Recognize similar and congruent figures.

H. Problem solving[1]	H. Solve appropriate word problems involving the
	1. Volume of
	  a) Cubes.
	  b) Rectangular solids.
	  c) Pyramids.
	  d) Spheres.
	  e) Cones,
	  f) Cylinders.

[1]Eighth grade mastery skill

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES

H. Problem solving[1]

2. Conversion of area measures
    a) In customary units ($in.^2$ to $ft.^2$ to $yd.^2$; $yd.^2$ to $ft.^2$ to $in.^2$).
    b) In metric (SI) units, (cm^2 to m^2; m^2 to cm^2).

[1]Eighth grade mastery skill

ACTIVITIES[1]

[1]Because of the review materials provided for whole numbers, decimals, and fractions, these sections of the activities and the curriculum outlines do not match. To locate activities in a specific skill, see the activities outline. Items for student work are listed under objectives in the activities section.

I.   Whole Numbers: Review and/or pretest material except where indicated
by an asterisk. Objectives marked by an asterisk are
for eighth grade mastery.

I. A.   CONTENT: Whole numbers; Addition
(Review)

OBJECTIVE: The student will be able to
1. Find the sum of whole numbers.
2. Evaluate expressions involving addition.

I. A. 1. ACTIVITIES: 1. Find the sum.

a)   472   b)   27,548   c)   283,464
     348   34,276   845,127
     723   76,482   462,293
     965   52,268   573,899

d)   5 + 6 + 7
e)   19 + 263
f)   24 + 65 + 183

I. A. 2.   2. Evaluate these expressions.

a) $n + 9$ where $n = 5$
b) $x + 6$ where $x = 8$
c) $a + 14$ where $a = 29$
d) $y + 231$ where $y = 63$
e) $b + 5 + 9$ where $b = 7$
f) $n + 15 + 84$ where $n = 37$

I. B.   CONTENT: Whole numbers; Subtraction
(Review)

OBJECTIVE: The student will be able to

1. Subtract whole numbers.
2. Evaluate expressions involving subtraction.

I. B. 1. ACTIVITIES: 1. Find the difference.
a)   418   b)   38,750   c)   974,823
     273   13,503   289,379

d)   6,278,322   e)   761 – 149
     2,984,625   f)   475 – 268
                    g)   1,345 – 796

I. Whole Numbers

I. B. 2.   2. Evaluate these expressions.

                               a) x − 9 if x = 12.
                               b) n − 13 if n = 22.
                               c) b − 36 if b = 54.
                               d) c − 213 if c = 479.
                               e) y − 900 if y = 2,291.
                               f) x − 4,621 if x = 27,105.

I. C.   CONTENT: Whole Numbers; Multiplication.
(Review)
             OBJECTIVE: The student will be able to

                           1. Multiply whole numbers.
                           2. Evaluate expressions involving
                               multiplication.

I. C. 1.   ACTIVITIES: 1. Find the product.

                               a) 43   b) 562   c) 8,574
                                   74   436   385

                               d) (45)(39)   g) 16 · 5
                               e) (96)(124)   h) (279)(8)
                               f) (465)(132)

I. C. 2.   2. Evaluate these expressions.

                               a) 5b if b = 7.
                               b) 8a if a = 9.
                               c) 26y if y = 38.
                               d) 123x if x = 271.

I. D.   CONTENT: Whole Numbers; Division
(Review)
             OBJECTIVE: The student will be able to

                           1. Divide whole numbers.
                           2. Evaluate expressions involving division.

I. D. 1.   ACTIVITIES: 1. Find the quotient. Express the remainder
                               as a fraction.

                               a) $6\overline{)42}$ b) $7\overline{)917}$ c) $5\overline{)862}$

                               d) $9\overline{)3672}$ e) $61\overline{)10,553}$

                               f) 654 ÷ 6
                               g) 274 ÷ 23
                               h) 6,835 ÷ 721
                               i) 34,582 ÷ 226

I.   Whole Numbers

I. D. 2.   2. Find the quotient. Express the remainder
                                    as a fraction.

                                a) $\frac{x}{6}$ if x = 48.

                                b) 81 ÷ n if n = 9.

                                c) 48 ÷ y if y = 6.

                                d) 1,683 ÷ x if x = 3.

                                e) y ÷ 41 if y = 14,842.

I. E.   CONTENT: Whole Numbers; Order of operations
(Review)
             OBJECTIVE: The student will be able to perform multiple
                                operations

                                1. Without grouping symbols.
                                2. With grouping symbols.

I. E. 1.   ACTIVITIES: 1. Perform the indicated operations.

                                a) 5 + 3 · 7
                                b) 15 − 6 · 2
                                c) 16 · 8 ÷ 2
                                d) 24 ÷ 2 · 3 + 6 · 2 ÷ 3
                                e) 36 ÷ 9 − 3 + 6 ÷ 2

I. E. 2.   2. Perform the indicated operations.

                                a) 3(6 − 2) + 5
                                b) 12 − (3 − ½)
                                c) 36 ÷ (9 · 2)
                                d) 24 ÷ (2 · 3) + 6(12 ÷ 3)
                                e) 48 ÷ (2 + 6) + 4(8 ÷ 2)
                                f) 2 [3 (4 − 2) + 18 ÷ (2·3)]

I. F.   CONTENT: Whole numbers; Properties
(Review)
             OBJECTIVE: The student will be able to recognize and
                                use the

                                1. Closure properties.
                                2. Commutative properties.
                                3. Associative properties.
                                4. Additive identity properties.
                                5. Multiplicative identity properties.

I.   Whole Numbers

I. F.   ACTIVITIES: Name the property that justifies each of the following:

a) 7 + 0 = 7
b) 4 + 5 = 5 + 4
c) 3 + 4 is a whole number
d) (3)(4) = (4)(3)
e) 6 + (7 + 8) = (6 + 7) + 8
f) 5·1 = 5
g) a + b = b + a
h) 3·4 is a whole number
i) x·y = y·x
j) (4)(5·6) = (4·5)·6
k) b·1 = b
l) (3·4)·5 = 3·(4·5)
m) (a)(b) is a whole number
n) a+(b+c) = (a+b)+c
o) c + 0 = 0
p) x·(y·z) = (x·y)·z

I. G.   CONTENT: Whole numbers; Problem solving

OBJECTIVE: *The student will be able to solve verbal proolems involving the addition and subtraction of measurement of

1. Length.
2. Weight.
3. Capacity.

I. G. 1.   ACTIVITIES: 1. Solve the following:

a) Jane is 5 ft. 8 in. tall. Her younger sister is 3 ft. 2 in. tall. How much taller is Jane?

b) The rectangular building in which spacecraft are assembled at Cape Kennedy in Florida is 199 meters long and 144 meters wide. Find the perimeter.

c) Jamestown is located 24 kilometers north of Jonesville. Lincoln is located 72 kilometers south of Jonesville. If Henry is going to travel from his home in Jamestown to Lincoln, how far will he have to travel?

I. G. 2.   2. Solve the following:

a) Bob and Ken both cut and wrap meat. Bob cut 47 lbs. 3 oz. Ken cut and wrapped 49 lbs. 6 oz. Find the amount both cut and wrapped.

19

35

I. Whole numbers

I. G. 2.   b) A trailer was loaded with 254 kg of
                         bricks. John unloaded 163 kg of bricks.
                         How many kilograms of bricks were left
                         on the trailer?

I. G. 3.   3. Solve the following:

                     a) Ann determined that she would reserve a
                         quantity of her homemade punch by re-
                         taining one gallon, one quart. She made
                         four gallons, two quarts. What amount
                         did she use?

                     b) Mike's automobile has a gas tank that will
                         hold 50 liters. When Mike fills his
                         tank, it holds 32 liters of gasoline.
                         How many liters of gasoline were in the
                         tank before it was filled?

II. Decimals: Review and/or pretest material except where indicated
     by an asterisk.

II. A.   CONTENT: Decimals; Place value
(Review)

              OBJECTIVE: The student will be able to read and write
                           decimal numbers from trillions to millionths.

II. A. 1.   ACTIVITIES: 1. Write the decimal equivalents using words.

                           a) 3.46   d) 2,463,712,138.4178
                           b) 10.101   e) 168,719,503,425,106.216
                           c) 7.000163

II. A. 2.   2. Write the decimal equivalents using numerals.

                           a) Three and five thousandths
                           b) One and eight hundred seventy-five ten-thousandths
                           c) Two hundred eighty-four and fifteen ten-thou-
                               sandths
                           d) Ten million, one hundred forty-two and nine
                               tenths
                           e) Five thousand eight and twenty-three
                               millionths

II. B.   CONTENT: Decimals; Addition
(Review)

              OBJECTIVE: The student will be able to

                           1. Find the sum of decimals.
                           2. Evaluate expressions involving addition.

II. Decimals

II. B. 1.	<u>ACTIVITIES:</u>	1. Add

    a)   .5312   b)   96.39   c)   .0384
        .7439   .4658   21.969

    d)   .39 + 14.863
    e)   .0175 + 21 + .063759
    f)   23,000.58 + 469.10057

II. B. 2.   2. Evaluate these expressions

    a) $a + 3.5$ if $a = 4.9$
    b) $x + .036$ if $x = 167.5$
    c) $.05682 + y$ if $y = .009349$
    d) $5,193.2703 + c$ if $c = 45.6$

II. C.
(Review)   <u>CONTENT:</u>   Decimals; Subtraction

           <u>OBJECTIVE:</u>   The student will be able to

1. Find the difference between decimals.
2. Evaluate expressions involving subtraction.

II. C. 1.   <u>ACTIVITIES:</u>   1. Subtract.

    a)   3.024   b)   2.0332   c)   66.5
        1.573   .9542   3.9284

    d)   20.00721 − .39215
    e)   211 − 39.86
    f)   .467 − .00938

II. C. 2.   2. Evaluate these expressions.

    a) $2.5 - a$ if $a = 1.6$
    b) $3.41 - x$ if $x = 2.38$
    c) $c - 1.876$ if $c = 7.653$
    d) $y - 3.459$ if $y = 10$

II. D.
(Review)   <u>CONTENT:</u>   Decimals; Multiplication

           <u>OBJECTIVE:</u>   The student will be able to

1. Multiply decimals.
2. Evaluate expressions involving multiplication.

II. D. 1.   <u>ACTIVITIES:</u>   1. Multiply.

    a)   (2.4)(8.7)
    b)   (75.9)(0.372)
    c)   (8.1)(.0001)
    d)   (3.6782)(.001)

II. Decimals

II. D. 2.   2. Evaluate these expressions.

                        a) 5.03(a) if a = 6.1
                        b) b(.09) if b = 1.1
                        c) (9.0006)(c) if c = 3.01
                        d) (5.92)(0.47)
                        e) (0.0082)(6.6)

II. E.   CONTENT: Decimals; Division
(Review)
          OBJECTIVE: The student will be able to

                        1. Divide decimals.
                        2. Evaluate expressions involving division.

II. E. 1. ACTIVITIES: 1. Divide.

                        a) $0.3\overline{)\,.24}$ b) $8.7\overline{)20.88}$

                        c) $0.372\overline{)28.2348}$

                        d) $65.2 \div 1.63$
                        e) $0.0036 \div 1.2$
                        f) $57.8462 \div .002$

II. E. 2.   2. Evaluate each.

                        a) $1.69 \div x$ if x = 1.3
                        b) $3.6 \div c$ if c = 0.09
                        c) $93.702 \div a$ if a = 2.4
                        d) $h \div 2.5$ if h = 37.595
                        e) $m \div .007$ if m = 0.56
                        f) $1.245 \div y$ if y = 5

II. F.   CONTENT: Decimals; Conversions

          OBJECTIVE: *The student will be able to write decimals as

                        1. Fractions.
                        2. Mixed numbers.

II. F. 1. ACTIVITIES: 1. Write each decimal as a fraction that is
                           reduced to lowest terms.

                        a) .8   c) .125
                        b) .5   d) .25

II. Decimals

II. F. 2.   2. Write each decimal as a mixed number
                                that is reduced to lowest terms.

                            a) 3.4   c) 10.625
                            b) 2.75   d) 7.5

II. G.   CONTENT: Decimals; Order of operations
(Review)

          OBJECTIVE: The student will perform multiple operations

                            1. Without grouping symbols.
                            2. With grouping symbols.

II. G. 1. ACTIVITIES: 1. Perform the indicated operations.

                            a) $5.7 + 3.2 \cdot (.07)$
                            b) $23.06 - (6.0075) \cdot (2)$
                            c) $18.5364 \div (8.13) \cdot (1.14)$
                            d) $26.11912 \div (2.003) \cdot (3.26) + 1.293 \div 3$
                            e) $34.404 + 9.0769 - 6.32458$

II. G. 2.   2. Perform the indicated operations.

                            a) $3.04 \cdot (6.2 - 3.5) \div .1481$
                            b) $12 - (7.08 - 5.932)$
                            c) $20.88 \div [(2.4) \cdot (8.7)] + 6.1(.1435 \div 5)$
                            d) $2.01 [.313 (4.16 - 2.96) + 3.75 \div (.25 \cdot .5)]$
                            e) $48 \div (1.92 + 6.08) + .02 [.01 (.712 \cdot 3) \div 1.5]$

II. H.   CONTENT: Decimals; Ordering and comparing
(Review)

          OBJECTIVE: The student will be able to

                            1. Compare two decimals.
                            2. Order three or more decimals.

II. H. 1. ACTIVITIES: 1. Replace each blank with <, >, or = to
                                make a true sentence.

                            a) 3.38 _____ 3.48
                            b) 4.2 _____ 4.18
                            c) 1.113 _____ 1.1041
                            d) 9,258.28 _____ 9,158.3
                            e) 345,168.174 _____ 345,168.1743

II. H. 2.   2. Write the decimals in order from least to
                                greatest.

                            a) 6.07, 6.70, .67
                            b) .467, .46, .4067
                            c) 6.3, 6.030, 6.29
                            d) 57.62, 37.72, 57.63, 57.61
                            e) 2134.9, 21.349, 213.49, 2.1349

II. Decimals

II. I. CONTENT: *Decimals; Problem solving

          OBJECTIVE: The student will be able to solve word problems
                         involving the use of money.

          ACTIVITIES: Solve the following.

                         a) Maria earned $32.75 and Juanita earned
                             $42.60. How much more did Juanita earn
                             than Maria?

                         b) Jane makes $5.35 an hour. How much would
                             she earn in a forty hour week?

MEAT	
Hamburger	$1.79 lb.
Lamb Roast	1.95 lb.
Steak	3.49 lb.
Beef Liver	1.29 lb.
Polish Sausage	1.99 lb.

                         Directions: Use the table above to answer
                         the questions below.

                         c) How much less per pound is lamb than steak?
                         d) If you bought a lamb roast for $5.97 and
                             a pound of hamburger, how much change would
                             you receive from a $10 bill?
                         e) Which costs less--two pounds of steak or
                             three pounds of liver; a three-pound lamb
                             roast or four pounds of hamburger?

III. Number Theory: Review and/or pretest erial except where
                       indicated by an asterisk.

III. A. CONTENT: Number theory; Divisibility tests

          OBJECTIVE: The student will be able to recognize numbers
                        that are (evenly) divisible by two, three,
                        four, five, six, nine, ten, and eleven.

          ACTIVITIES: Which of the following numbers are divisible:

                        a) by 2? (Rule: divisible by 2 if the ones
                            digit is 0, 2, 4, 6, or 8.)

                            (1) 4,280   (2) 825   (3) 423

24
40

III. Number theory

III. A.   b) by 3? (Rule: divisible by 3 if the sum
                                           of the digits is divisible by 3.)

                                           (1) 625   (2) 4,280   (3) 5,655

                                       c) by 4? (Rule: divisible by 4 if the 2-digit
                                           number formed by its tens and ones digits is
                                           divisible by 4.)

                                           (1) 825   (2) 1,008   (3) 5,655

                                       d) by 5? (Rule: divisible by 5 if the ones
                                           digit is 0 or 5.)

                                           (1) 1,008   (2) 129,456   (3) 625

                                       e) by 6? (Rule: divisible by 6 if its ones
                                           digit is 0, 2, 4, 6, or 8 and the sum of
                                           its digits is divisible by 3.)

                                           (1) 726   (2) 641   (3) 425

                                       f) by 9? (Rule: divisible by 9 if the sum
                                           of the digits is divisible by 9.)

                                           (1) 396   (2) 346   (3) 280

                                       g) by 10? (Rule: divisible by 10 if the
                                           ones digit is 0.)

                                           (1) 261   (2) 825   (3) 4,280

III. B.   CONTENT: Number theory; Prime factors

           OBJECTIVE: The student will be able to:

                           1. Define and identify prime and composite
                               numbers.

                           2. Identify the factors and prime factors
                               of a number.

                           3. Write a number as the product of its
                               prime factors (17 or less).

III. Number theory

III. B. 1.   ACTIVITIES: 1.   Present a chart with the numbers 1 to 100,
ten numbers per line. Have students do the
following activity:

  a) Cross out 1 since it is not a prime
      number.
  b) Circle 2. Cross out all multiples of 2.
  c) Circle 3. Cross out all multiples of 3.
  d) Circle 5. Cross out all multiples of 5.
  e) Continue until all numbers are either
      circled or crossed out.

The result is the identification of prime
numbers (numbers greater than one with exactly
two factors: 1 and the number itself) and
composite numbers (any number that is not
prime). [Sieve of Eratosthenes]

III. B. 2.   2.   Write all the factors of each number given.
Identify each factor as a prime or composite
number.

  a) 24   d) 36
  b) 52   e) 20
  c) 60   f) 18

III. B. 3.   3.   Show the students how to do factor trees.
After an understanding is established of how
factors are found, introduce the use of
exponents in writing the prime factorization.

Factor the number 12 using the factor tree:
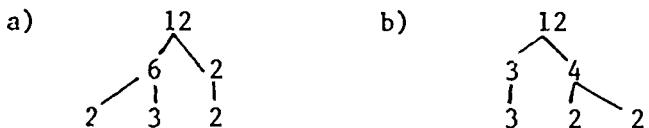
Finally, using exponents the end product is
$12 = 2^2 \cdot 3$ using either factor tree.

Factor the number 12 using the "division by
primes" method:

$$12 = 2 \cdot 2 \cdot 3$$
$$12 = 2^2 \cdot 3$$

III. Number theory

III. C.   CONTENT: Number theory; Exponents

OBJECTIVES: The student will be able to:

1.   Define and identify a base and an exponent.
*2.   Write the exponential form of a power of ten given in standard form.
3.   Extract the square root of a number that is a perfect square.
*4.   Write the standard form of a number given in exponential form.
*5.   Write a product of a variable as a power of that variable. Identify factored form and exponential form for each.

III. C. 1. ACTIVITIES: 1.   Illustrate the terms with an example such as:

exponent
      ↓
$(4)^3 = 4 \cdot 4 \cdot 4 = 64$
 ↑   ↑
base   factors

III. C. 2.   2.   Extend understanding of the terms base and exponent using powers of ten such as

    a) $100 = 10 \cdot 10 = 10^2$
    b) $1000 = 10 \cdot 10 \cdot 10 = 10^3$
    c) $10,000 = 10 \cdot 10 \cdot 10 \cdot 10 = 10^4$

III. C. 3.   3.   If $x^2 = y$, then x is a square root of y. For instance, since $5^2 = 25$, 5 is the square root of $25 (5 = \sqrt{25})$.

    a)   Numbers 1-100 which are perfect squares are: 1, 4, 9, 16, 25, 36, 49, 64, 81, and 100.

    b)   For a procedure for extracting a square root, see appendix.

III. C. 4.   4.   Write the standard form of the numbers:

    a) 3^4 b) 17^0 c) 8^1

III. C. 5.   5.   Write each product as a power of the variable. Identify factored form and exponential form for each.

    a) $y \cdot y$ b) $n \cdot n \cdot n$ c) $x \cdot x \cdot x \cdot x$

III. Number theory

III. D.   CONTENT: Number theory; Greatest common factor (GCF)

           OBJECTIVES: The student will use prime factors to determine
                        the greatest common factor of two or more numbers.

III. D. 1. ACTIVITIES: 1. Several methods may be used

                         a) Write all the factors of each. Select
                             the largest factor belonging to both.

                             36 and 54: 36 = 1, 2, 3, 4, 9, $\underline{18}$, 12, 36
                                        54 = 1, 2, 3, 6, 9, $\underline{18}$, 27, 54
                             $\underline{18}$ is the GCF.

                         b) 54 and 36   Subtract the smaller
                                                from the larger until
                             54   36   the answers are the same.
                             -36 -18
                             $\overline{18}$ $\overline{18}$ since 18 = 18

                         c) 54 and 36   Divide smaller into larger.
                                                Difference becomes divisor.
                                 1   Divisor becomes dividend.
                             $36\overline{)54}$ Continue until difference is 0.
                             -36 2   Final divisor is GCF.
                             $\overline{18}$ | $\overline{36}$
                                     -36
                                     $\overline{0}$

                         d) Prime factorization method:

                             $36 = 2^2 \cdot 3^2$ $2 \cdot 3^2 = 2 \cdot 9 = 18$

                             $54 = 2 \cdot 3^3$

                             1) Select the smallest power of the
                                 common prime factors.

                             2) Multiply their values.

III. E.   CONTENT: Number theory: Least common multiple (LCM)

           OBJECTIVE: The student will use prime factors to determine
                        the least common multiple of two or more numbers.

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III. Number theory

III. E. 1. ACTIVITIES: 1. Review the meaning of a multiple of a
                             number, using a table such as given below.

9·1	9·2	9·3	9·4	9·5	9·6
9	18	27	36	45	54

a) Have students play the game, "I am a
    Multiple." Directions: One person
    is IT. Everyone else is a challenger.
    Whoever is IT chooses a secret number
    (for example, 15). Students must try
    to find out the number by asking
    questions in the form, "Are you a
    multiple of ...?" Only when a student
    is certain that he knows IT's number
    may he ask "Are you 15?" If correct,
    then he becomes IT. If he isn't
    correct, the person who is IT remains
    IT for the next game.

b) Have students list the multiples
    for each and then select the least
    common multiple (LCM) for each pair.

    1) 6 and 8:   6, 12, 18, $\underline{24}$, 30, etc.
                   8, 16, $\underline{24}$, $\overline{32}$, etc.

    2) 10 and 12: 10, 20, 30, 40, 50, $\underline{60}$
                    12, 24, 36, 48, $\underline{60}$

    3) 9 and 12: 9, 18, 27, $\underline{36}$, 45
                   12, 24, $\underline{36}$, $\overline{48}$

c) Use prime factorization to find LCM:

    $36 = 2^2 \cdot 3^2$ LCM $= 2^3 \cdot 3^2 \cdot 5 = 360$

    $120 = 2^3 \cdot 3^1 \cdot 5^1$

    1) Use the largest power of each prime
        factor.

    2) Multiply.

III. Number theory

III. F.   CONTENT: Number theory; Scientific notation

          OBJECTIVE: The student will be able to:

                          *1. Express numbers in scientific notation.
                          *2. Interpret numbers given in scientific
                               notation.

III. F. 1. ACTIVITIES: 1. Express each as a number in scientific
                              notation.

                          a) 340   d) 6,000,000
                          b) 5600   e) 847,000
                          c) 12.7   f) 5.9

III. F. 2.   2. Express each as a number in standard form.

                          a) 2×10^4 d) 4.32×10^1
                          b) 3.4×10^6 e) 6.1×10^5
                          c) 5.8×10^2 f) 8×10^9

III. G.   CONTENT: Number theory; Order of operations

          OBJECTIVES: The student will perform multiple operations:

                          (1) With exponents and without grouping
                               symbols:

                          (2) With exponents and with grouping symbols.

          ACTIVITIES: "Please Excuse My Dear Aunt Sally"
                          is an expression which may be helpful for
                          students in remembering order of operations.
                          The first letter in each word denotes the
                          order: P = parenthesis, E = exponent,
                          M = multiplication, D = division, A =
                          addition, S = subtraction.

                          The correct order of operations is
                                        P
                                        E
                                        M-D
                                     ↓ A-S
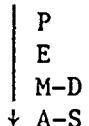
III. Number theory

III. G.   Note that multiplication and division occupy
                                the same "level" and should be done in order
                                from left to right as encountered in the
                                expression being evaluated. Addition and
                                subtraction also occupy the same "level" and
                                follow the "left-to-right" rule.

                                Evaluate each expression.

III. G. 1.   1. Evaluate each.

                                    a) $3 + 2^2 \cdot 5$
                                    b) $88 \div 4 - 6 \cdot 2$
                                    c) $4 + 3^2$
                                    d) $6 + 8^2 \div 16 \cdot 2 - 4$

III. G. 2.   2. Evaluate each.

                                    a) $(5^2 + 2)6 - 32 \div 8$
                                    b) $10 + (8 - 6)^2 \cdot 4 \div 2$
                                    c) $[(2^3+3)(8^2-4) \div 2] - 5 \cdot 2$

IV. Fractions: Review and/or pretest material except where indicated
                 by an asterisk.

IV. A.   CONTENT: Fractions; Renaming fractions
(Review)
           OBJECTIVE: The student will be able to rename a fraction in
                         higher or lower terms.

           ACTIVITIES: Complete to find an equivalent fraction.

                         a) $\dfrac{3}{7} = \dfrac{?}{14}$

                         b) $\dfrac{4}{5} = \dfrac{?}{35}$

                         c) $\dfrac{7}{9} = \dfrac{?}{63}$

                         d) $\dfrac{1}{14} = \dfrac{3}{?}$

                         e) $\dfrac{24}{36} = \dfrac{2}{?}$

                         f) $\dfrac{56}{64} = \dfrac{?}{8}$

IV. Fractions

IV. B.　　CONTENT:　　　Fractions; Multiplication

　　　　　OBJECTIVE:　　　The student will be able to:

　　　　　　　　　　1.　Multiply two fractions expressing the
　　　　　　　　　　　　results in simplest terms.

　　　　　　　　　　2.　Find the product of whole numbers, mixed
　　　　　　　　　　　　numbers, and fractions.

　　　　　　　　　*3.　Multiply using the concept of cancellation.

IV. B.　　ACTIVITIES:　　1. and 3.　Write the product in lowest terms.
1. and 3.

　　　　　　　　　　　　a)　$\frac{1}{3} \cdot \frac{1}{2}$

　　　　　　　　　　　　b)　$\frac{3}{4} \cdot \frac{5}{7}$

　　　　　　　　　　　　c)　$\frac{2}{3} \cdot \frac{9}{10}$

　　　　　　　　　　　　d)　$\frac{8}{12} \cdot \frac{4}{6}$

IV. B. 2. and 3.　　　　2. and 3.　Write the product in lowest terms.

　　　　　　　　　　　　a)　$\frac{3}{5} \cdot 15$

　　　　　　　　　　　　b)　$2\frac{3}{4} \cdot \frac{4}{5}$

　　　　　　　　　　　　c)　$1\frac{2}{3} \cdot 3\frac{1}{5}$

　　　　　　　　　　　　d)　$6\frac{1}{2} \cdot 3$

　　　　　　　　　　　　e)　$\frac{15}{19} \cdot 3\frac{1}{6}$

IV. C.　　CONTENT:　　　Fractions; Division
(Review)
　　　　　OBJECTIVE:　　　The student will be able to:

　　　　　　　　　　1.　Identify the multiplicative inverse
　　　　　　　　　　　　(reciprocal) of a fraction.

IV. Fractions

2. Divide a fraction by a fraction, expres-
sing the quotient in simplest form.

3. Find the quotient of whole numbers,
mixed numbers and/or fractions, expres-
sing results in simplest form.

IV. C. 1. <u>ACTIVITIES</u>:   1. Write the multiplicative inverse (reciprocal)
of each.

    a) $\quad$ 4 $\qquad$ c) $\frac{3}{2}$ $\qquad$ e) $\quad$ a $\qquad$ g) $\frac{b}{a}$

    b) $\frac{1}{3}$ $\qquad$ d) $\frac{1}{9}$ $\qquad$ f) $\frac{1}{c}$ $\qquad$ h) $\frac{3m}{8}$

IV. C. 2.   2. Divide and express answers in simplest form.

    a) $\frac{2}{3} \div \frac{1}{5}$

    b) $\frac{1}{4} \div \frac{3}{8}$

    c) $\frac{2}{5} \div \frac{3}{4}$

    d) $\frac{3}{5} \div \frac{6}{15}$

IV. C. 3.   3. Divide and express answers in simplest form.

    a) $\frac{1}{5} \div 4$

    b) $\frac{3}{12} \div \frac{6}{36}$

    c) $2 \div \frac{3}{4}$

    d) $3\frac{1}{2} \div 4\frac{6}{8}$

    e) $1\frac{7}{9} \div 18$

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IV. Fractions

IV. D.   CONTENT: Fractions; Addition
(Review)
           OBJECTIVE: The student will be able to:

           1. Add two fractions or mixed numbers with
               like denominators (no simplifying).

           2. Add two fractions with like denominators,
               expressing results in simplest form.

           3. Add two fractions with unlike denominators,
               expressing results in simplest form.

           4. Find the sum of whole numbers, fractions,
               and/or mixed numbers with like or unlike
               denominators, expressing results in
               simplest form.

IV. D. 1. ACTIVITIES: 1. Solve each of the following.

           a) $\frac{7}{9} + \frac{1}{9}$

           b) $\frac{3}{8} + \frac{4}{8}$

           c) $\frac{9}{17} + \frac{4}{17}$

           d) $5\frac{1}{3} + 9\frac{1}{3}$

           e) $4\frac{3}{5} + \frac{1}{5}$

           f) $5\frac{1}{7} + 2\frac{3}{7}$

IV. D. 2.   2. Solve each of the following:

           a) $\frac{9}{15} + \frac{1}{15}$

           b) $\frac{3}{16} + \frac{5}{16}$

           c) $\frac{13}{20} + \frac{7}{20}$

           d) $\frac{6}{25} + \frac{9}{25}$

IV. Fractions

IV. D. 3.   3. Write the sum in lowest terms.

　　　　　　　　　　　a) $\frac{2}{7} + \frac{2}{14}$

　　　　　　　　　　　b) $\frac{5}{6} + \frac{2}{3}$

　　　　　　　　　　　c) $\frac{3}{10} + \frac{5}{6}$

IV. D. 4.   4. Write the sum in lowest terms.

　　　　　　　　　　　a) $\frac{5}{7} + \frac{11}{14}$

　　　　　　　　　　　b) $9 + \frac{6}{11}$

　　　　　　　　　　　c) $7\frac{1}{3} + 6$

　　　　　　　　　　　d) $2\frac{5}{8} + 3\frac{11}{24}$

IV. E.   CONTENT: Fractions; Subtraction
(Review)

            OBJECTIVE: The student will be able to:

            1. Subtract fractions or mixed numbers with
                like denominators, expressing results in
                simplest form.

            2. Subtract fractions or mixed numbers with
                unlike denominators, expressing results
                in simplest form.

            3. Find the difference between whole numbers,
                mixed numbers, or fractions with or without
                like denominators, expressing the results in
                simplest form.

IV. Fractions

IV. E. 1. <u>ACTIVITIES</u>:   1. Write the difference in lowest terms.

    a) $\dfrac{7}{6} - \dfrac{5}{6}$

    b) $\dfrac{7}{10} - \dfrac{3}{10}$

    c) $5\dfrac{4}{15} - 2\dfrac{1}{15}$

    d) $6\dfrac{1}{8} - \dfrac{3}{8}$

    e) $6\dfrac{1}{3} - 4\dfrac{2}{3}$

IV. E. 2. and 3.   2. and 3. Write the difference in lowest terms.

    a) $\dfrac{7}{8} - \dfrac{3}{24}$

    b) $\dfrac{5}{6} - \dfrac{7}{30}$

    c) $\dfrac{4}{7} - \dfrac{3}{14}$

    d) $5 - 3\dfrac{1}{3}$

    e) $8\dfrac{1}{5} - 6$

    f) $8\dfrac{5}{18} - 6\dfrac{7}{12}$

IV. F.   <u>CONTENT</u>:   Fractions; Order of operations
(Review)

        <u>OBJECTIVE</u>:   The student will be able to:

1. Perform multiple operations without grouping symbols.

2. Perform multiple operations with grouping symbols.

IV. Fractions

IV. F.   <u>ACTIVITIES</u>:   1. and 2. Perform the indicated operations.
1. and 2.

a) $\frac{1}{2} \cdot \frac{4}{5} + \frac{7}{8} \div 2\frac{1}{2} - \frac{1}{4}$

b) $\frac{3}{8} \cdot \frac{2}{3} + 1\frac{1}{2} - \frac{3}{4} \div \frac{3}{5}$

c) $\frac{1}{2} [\frac{3}{4} (\frac{1}{3} + \frac{1}{2}) - \frac{3}{8}]$

d) $5[(4\frac{2}{3} + \frac{1}{5}) - (\frac{1}{15} + \frac{3}{5})]$

e) $\frac{4}{5} \cdot \frac{5}{6} + \frac{3}{8} \div \frac{1}{4} - \frac{1}{8}$

f) $\frac{3}{4} \cdot \frac{2}{9} + 2\frac{1}{2} - \frac{1}{4} \div \frac{3}{5}$

g) $\frac{1}{4} [\frac{2}{3} (\frac{1}{3} \div \frac{1}{2}) - \frac{4}{9}]$

h) $3 [(4\frac{3}{4} + \frac{1}{2}) (\frac{1}{2}) - \frac{3}{8}]$

IV. G.   <u>CONTENT</u>:   Fractions; Fractional conversion
(Review)

            <u>OBJECTIVE</u>:   The student will be able to:

            1. Change common fractions to decimals.

            2. Change mixed numbers to decimals.

IV. G.   <u>ACTIVITIES</u>:   1. and 2. Write the fraction or mixed
1. and 2.   numeral as a terminating or repeating
                                decimal.

a) $\frac{3}{5}$ f) $1\frac{5}{8}$

b) $\frac{7}{10}$ g) $\frac{5}{4}$

c) $\frac{12}{25}$ h) $\frac{32}{10}$

d) $\frac{7}{9}$ i) $2\frac{8}{9}$

e) $\frac{11}{12}$ j) $\frac{65}{40}$

IV. Fractions

IV. H.   CONTENT: Fractions; Ordering and comparing
(Review)
            OBJECTIVE: The student will be able to:

            1. Determine the greater or lesser by
               comparing two fractions.

            2. Determine the correct order of a set
               of fractions.

IV. H. 1.   ACTIVITIES: 1. Replace each __ with >, <, or = to make
                            a true statement.

            a) $\frac{2}{3}$ __ $\frac{3}{4}$ d) $\frac{16}{40}$ __ $\frac{2}{5}$ g) $\frac{9}{25}$ __ $\frac{4}{50}$

            b) $\frac{5}{12}$ __ $\frac{10}{24}$ e) $\frac{11}{13}$ __ $\frac{33}{39}$ h) $\frac{14}{48}$ __ $\frac{7}{24}$

            c) $\frac{8}{15}$ __ $\frac{3}{5}$ f) $\frac{25}{30}$ __ $\frac{5}{7}$ i) $\frac{4}{5}$ __ $\frac{4}{6}$

IV. H. 2.   2. Write the fractions in order from least
                             to greatest.

            a) $\frac{2}{3}$, $\frac{3}{5}$, $\frac{1}{2}$

            b) $\frac{13}{24}$, $\frac{3}{8}$, $\frac{5}{12}$, $\frac{1}{2}$

            c) $\frac{13}{21}$, $\frac{17}{42}$, $\frac{5}{?}$, $\frac{2}{3}$, $\frac{4}{7}$

            d) $\frac{1}{4}$, $\frac{5}{28}$, $\frac{2}{7}$

            e) $\frac{8}{9}$, $\frac{5}{6}$, $\frac{13}{18}$, $\frac{2}{3}$

            f) $\frac{17}{30}$, $\frac{5}{6}$, $\frac{4}{5}$, $\frac{9}{10}$, $\frac{2}{3}$

IV. I.   CONTENT: Fractions; Problem solving

         OBJECTIVE: *The student will be able to solve word pro-
                     blems involving money.

                     a) A gas tank holds 12 gallons of gasoline.
                        The pump registered 9½ gallons at a cost
                        of 77 9/10 cents per gallon. How much did
                        the gasoline cost?

IV. Fractions

IV. I.

    b) Fabric sells for $18 per yard. Maria needs 5 3/4 yards. What is the price of the fabric?

    c) City Cab charges $2 per mile. Jean rides 4 3/4 miles in a cab. How much does she owe the cab driver?

V. Ratio, Proportion, Percent

V. A.   <u>CONTENT</u>:   Ratio, proportion, percent; Ratio

      <u>OBJECTIVE</u>: The student will be able to write ratios as fractions.

      <u>ACTIVITIES</u>: Change each of the following ratios to a fraction.

      a) 3 to 5
      b) 10 out of 25 rides
      c) 2:12
      d) eleven out of twenty-one free throws

V. B.   <u>CONTENT</u>:   Ratio, proportion, percent; Proportion

      <u>OBJECTIVE</u>: The student will be able to:

    *1. Identify equivalent ratios as proportions.

    2. Define and identify the parts (terms) of a proportion (means and extremes).

    3. Solve for the missing term of a proportion.

V. B. 1. <u>ACTIVITIES</u>: 1. Identify each as a proportion or not a proportion.

    a) $\frac{1}{2} = \frac{3}{6}$ c) $\frac{3}{5} = \frac{5}{3}$

    b) $\frac{9}{12} = \frac{12}{16}$ d) $\frac{3}{6} = \frac{4}{10}$

V. Ratio, proportion, percent

V. B. 2.　　　　　　　　　2. Identify the means and extremes of the following.

　　　a) $\frac{2}{4} = \frac{3}{6}$　　　　　　　b) $\frac{6}{8} = \frac{16}{24}$

V. B. 3.　　　　　　　　　3. Solve for the missing term.

　　　a) $\frac{1}{2} = \frac{x}{16}$

　　　b) $\frac{5}{x} = \frac{20}{16}$

V. C. 1. <u>CONTENT</u>:　　　Ratio, proportion, percent; Percent

　　　<u>OBJECTIVE</u>:　　　The student will be able to

　　　*1. Change proper and improper fractions or mixed numbers to percents.

　　　2. Change a percent to a decimal number.

　　　3. Change a percent to a fraction in lowest terms.

　　　*4. Find the percent of increase or decrease.

　　　*5. Use percentages less than one percent.

　　　*6. Distinguish between simple and compound interest.

　　　*7. Define straight salary and commission.

V. C. 1. <u>ACTIVITIES</u>:　　1. Write as a percent.

　　　a) $\frac{25}{100}$

　　　b) $\frac{1}{5}$

　　　c) $\frac{2}{3}$

　　　d) $\frac{3}{2}$

　　　e) $2\frac{1}{2}$

V. Ratio, proportion, percent

V. C. 2.   2. Write as a decimal.

                               a) 75%
                               b) 52%
                               c) 0.403%

V. C. 3.   3. Write as a fraction in lowest terms.

                               a) 60%
                               b) 53%
                               c) 44%

V. C. 4.   4. Find the percent of increase or decrease.

                               a) from 25 to 40
                               b) from 40 to 25
                               c) from 100 to 112
                               d) from 200 to 90
                               e) from 90 to 200

V. C. 5.   5. Write as a percent.

                               a) 0.008
                               b) 0.0025
                               c) Fill in the blank.

                                   (1) .5% of 25 = _____
                                   (2) _____ % of 25 = .125
                                   (3) .5% of _____ = .125

V. C. 6.   6. Define simple interest and compound interest.

V. C. 7.   *7. Define each.

                               a) Straight salary.

                               b) Commission.

V. D.   CONTENT: Ratio, proportion, percent; Problem solving

          OBJECTIVE: *The student will solve appropriate word problems

                       *1. Involving simple interest.
                       *2. The computation of price and sale price, tax,
                            discount, and rate of discount.

V. Ratio, proportion, percent

V. D. 1. ACTIVITIES: 1. Solve each.

     a) What is the interest on $8000 at 5% for
       2 years?

     b) What is the interest on $350 at 6% for
       5 years?

V. D. 2.   2. Solve each.

     a) Jim bought a sweater for $26.95, a shirt
       for $12.45, and a pair of jeans for $19.98.
       What is his total price for the articles
       he bought?

     b) In the problem above, if the tax rate is
       5%, how much tax will Jim owe?

     c) A sweater marked $20.00 is on sale for
       20% off. What is the amount of discount?

     d) Jane bought a pair of jeans for $15 that
       were regularly sold for $20. What was the
       rate of discount?

VI. Integers, Rational Numbers, and Real Numbers

VI.   A.   <u>CONTENT</u>:   Integers, rational numbers, and real numbers;
Definitions

<u>OBJECTIVE</u>:   The student will be able to define and identify
integers, rational numbers, irrational numbers,
and real numbers.

<u>ACTIVITIES</u>:   Define and identify each of the following as:

(1)   Natural numbers
(2)   Whole numbers
(3)   Integers
(4)   Rational numbers
(5)   Irrational numbers
(6)   Real numbers

Each item may have multiple answers.

a)   0

b)   −1.2

c) $\frac{3}{4}$

d) $\sqrt{16}$

e) $\sqrt{3}$

f) π

g)   1.5

h) $\frac{2}{3}$

VI.   Integers, rational numbers, and real numbers

VI. B.   <u>CONTENT:</u>   Number line; Construction

          <u>OBJECTIVES:</u>   The student will be able to construct a number
                            line and

                            1. Identify the coordinate of a point.
                            2. Plot a designated point.

VI. B. 1. <u>ACTIVITIES:</u>   1. Identify the coordinate of each.
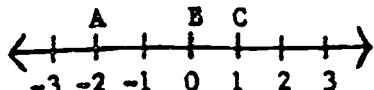
                                a)   b)   c)

VI. B. 2.   2. Plot each of the following points on a
                                    number line.

                                    a) −2
                                    b) 0
                                    c) $\sqrt{9}$

VI. C.   <u>CONTENT:</u>   Subsets of the real numbers

          <u>OBJECTIVE:</u>   The student will be able to diagram the subsets
                            of the real number system.

VI. C.   <u>ACTIVITIES:</u>   See appendix for example.

VI. D.   <u>CONTENT:</u>   Number line; Graphs of subsets

          <u>OBJECTIVE:</u>   The student will graph various subsets of real
                            numbers.

          <u>ACTIVITIES:</u>   Graph each.

                                a) x > 2
                                b) x ≤ −1
                                c) x ≠ 4

VI. Integers, rational numbers, and real numbers

VI. E. <u>CONTENT</u>:   Number line; Absolute value

      <u>OBJECTIVE</u>:   The student will define and determine the absolute
                  value of a real number.

      <u>ACTIVITIES</u>:   a) Define the absolute value of a real number.

                    b) Find the absolute value of the following
                        real numbers.

                        (1) $|2|$ (3) $|-4|$

                        (2) $|0|$ (4) $|\frac{1}{2}|$

VI. F. <u>CONTENT</u>:   Integers, rational numbers, and real numbers;
                  Operations

      <u>OBJECTIVE</u>:   The student should be able to perform the opera-
                  tions of addition, subtraction, multiplication,
                  and division of:

                  1. Integers
                  2. Rational numbers
                  3. Real numbers

VI. F. 1. <u>ACTIVITIES</u>:   1. Perform the indicated operation.

a)	3 + 2	i)	5 · 6
b)	−5 + 4	j)	(−3) · 7
c)	8 + (−6)	k)	6 · (−9)
d)	−1 + (−7)	l)	(−4)(−8)
e)	6 − 4	m)	12 ÷ 4
f)	−8−3	n)	−16 ÷ 8
g)	5−(−6)	o)	24 ÷ (−3)
h)	−7−(−9)	p)	−50 ÷ (−10)

VI.   Integers, rational numbers, and real numbers

VI. F. 2.   2.   Perform the indicated operation.

a) $\frac{3}{4} + \frac{1}{2}$ q)   2.6 + 13.45

b) $-\frac{3}{8} + \frac{2}{3}$ r)   −0.179 + 3.92

c) $5\frac{1}{3} + (-2\frac{1}{2})$ s)   2.356 + (−15.6)

d) $-11 + (-4\frac{5}{6})$ t)   −1.4 + (−16.38)

e). $\frac{5}{6} - \frac{2}{3}$ u)   3.9−2.47

f) $-\frac{4}{9} - \frac{1}{6}$ v)   −0.38−1.4

g) $4\frac{2}{5} - (-1\frac{3}{4})$ w)   35.6−(−2.75)

h) $-6 - (-2\frac{1}{2})$ x)   −8−(−4.2)

i) $\frac{3}{8} \cdot \frac{4}{9}$ y)   (3.7)(4.03)

j) $(-\frac{2}{7}) \cdot \frac{5}{6}$ z)   (−0.03)(2.7)

k) $(2\frac{1}{2}) \cdot (-\frac{2}{5})$ aa)   (3.5)(−0.02)

l) $(-4) \cdot (-\frac{3}{8})$ bb)   (−6.95)(−0.005)

m) $\frac{2}{5} \div \frac{3}{10}$ cc)   2 ÷ 0.05

n) $(-\frac{3}{4}) \div (\frac{1}{2})$ dd)   (−6.32) ÷ 0.4

o) $\frac{2}{9} \div (-1\frac{1}{3})$ ee)   16.23 ÷ (−0.03)

p) $(-\frac{4}{5}) \div (-4)$ ff)   (−2.6) ÷ (−0.005)

VI. F. 3.   3.   For activities for real numbers, use a mixture of
activities 1. and 2. above.

VI. Integers, rational numbers, and real numbers

VI. G.   CONTENT: Integers, rational numbers, and real numbers;
                         Order of operations

         OBJECTIVE: The student will be able to perform multiple
                         operations on real numbers with or without
                         grouping symbols.

         ACTIVITIES: Perform the indicated operations.

                         a) $(3^2 - \frac{2}{3} \cdot 1\frac{1}{2}) \div (-2) + 8.6$

                         b) $16 \div (-\frac{1}{2}) - (4.2)(5) + 13.9$

VI. H.   CONTENT: Integers, rational numbers, and real numbers;
                         Properties

         OBJECTIVE: The student will be able to recognize and use:

         1. Closure properties   7. Multiplicative inverse
         2. Commutative properties   8. Distributive property
         3. Associative properties   9. Multiplicative property
         4. Additive identity properties   of 0
         5. Multiplicative identity
             properties
         6. Additive inverse

         ACTIVITIES: Fill in the blank with the letter of the best choice.
                         Each property is dealing with the set of numbers.
                         Each variable represents a real number.

1. Closure under addition   9. Additive inverse
2. Closure under multiplication   10. Multiplicative inverse
3. Commutative property of addition   11. Distributive property of
4. Commutative property of multiplication   multiplication over addition
5. Associative property of addition   12. Multiplicative property of 0
6. Associative property of multiplication
7. Additive identity properties
8. Multiplicative identity properties

a) $2xy \cdot 1 = 2xy$ h) $(4 \cdot x) \cdot (-3) = 4 \cdot [x \cdot (-3)]$

b) $-5 \cdot (-\frac{1}{5}) = 1$ i) $4 \cdot \sqrt{3}$ is a real number

c) $(3+5)+8 = 3+(5+8)$ j) $6 + (-6) = 0$

d) $6 + 3.8$ is a real number   k) $(-\frac{4}{5})(r) = (r)(-\frac{4}{5})$

e) $3(a+b) = 3a + 3b$ l) $.3x^2y + 0 = .3x^2y$

f) $5+a = a+5$

g) $(-3)(0) = 0$

VI. Integers, rational numbers, and real numbers

VI. I.   CONTENT: Integers, rational numbers, and real numbers;
                        Problem solving

          OBJECTIVE: The student will be able to solve appropriate
                        word problems involving the use of operations
                        with real numbers.

          ACTIVITIES: Use positive and negative real numbers to
                        represent each situation. Then perform the
                        indicated operation.

                        a) Three penalties of 5 yards each
                        b) Six times a debt of $10.60
                        c) Three and one-half yards of fabric at $2.75
                            per yard

VII. Elementary Algebra

VII. A.   CONTENT: Elementary algebra; Evaluate expressions

          OBJECTIVE: The student will be able to evaluate an
                        algebraic expression given a replacement
                        set for the variable(s), using the property
                        of substitution.

VII. A. 1. ACTIVITIES: 1. Evaluate for the given values of the
                            variables.

                            a) $30 + 2t$ for $t = 10$

                            b) $\dfrac{2(b+3)}{8}$ for $b = 9$

                            c) $2a + b$ for $a = 7$ and $b = 5$

                            d) $\dfrac{c \cdot c \cdot c}{a \cdot a}$ for $a = 3$ and $c = 9$

                            e) $\dfrac{3}{4} z + \dfrac{5}{7} t$, for $z = 16$ and $t = 35$

                            f) $\dfrac{3}{w-v}$ for $w = 10$ and $v = 4$

                            g) $4.6u - 0.7p$ for $u = .2$ and $p = 3$

VII. A. 2.   2. Find B for each formula.
                            The replacement set for n is $\{8, 10, 12\}$

                            a) $B = \dfrac{n}{3} + \dfrac{2}{3} n$ d) $B = 3n - \dfrac{2}{3}$

                            b) $B = 5n$

                                                                          e) $B = 2n(7+n)$
                            c) $B = \dfrac{4+n}{2}$

VII.   Elementary algebra

VII.   B.   <u>CONTENT</u>:   Operations on polynomials

           <u>OBJECTIVE</u>:   The student will be able to:

           1. a) Define the term monomial.
               b) Define and identify like terms.
               c) Define binomial, trinomial, and polynomial.
               d) Add and subtract polynomials.

           2. Multiply two or more monomials
           3. Multiply a polynomial by a monomial
               (Distributive property).
           4. Divide a monomial by a monomial.

VII. B. 1. <u>ACTIVITIES</u>:   1. a), b), c), d). Matching:
a), b), c), d)

           (a) term   _____(1) terms having the
           (b) monomial   same variables.
           (c) binomial   Corresponding
           (d) trinomial   variables have the
           (e) polynomial   same exponent.
           (f) "like terms"   _____(2) a polynomial with
                                          three terms.
                                _____(3) a term that is the
                                          product of numbers
                                          and variables with
                                          positive exponents.
                                _____(4) a real number, a
                                          variable, or the pro-
                                          duct of a real number
                                          and a variable.
                                _____(5) a monomial or the
                                          sum of monomials.
                                _____(6) sum or difference
                                          of two monomials.

VII. B. 1. <u>ACTIVITIES</u>:   1. b), c) Identify the following pairs of
b), c)   terms as like or unlike.

           (1) $4x$ and $7x$ (6) $11a^2b$ and $9a^2b$
           (2) $-3t$ and $-3t^2$ (7) -2 and $-2a$
           (3) $5a$ and $-6a$ (8) x^2y^4 and $6x^2y^4$
           (4) $2st$ and s^2t (9) $7ab^2$ and $2a^2b$
           (5) $-6y$ and $4.2y$ (10) 4 and 26

VII. B. 1. <u>ACTIVITIES</u>:   1. d) Add and subtract as indicated. Combine
d)   like terms:

           (1) $6x + 2x$ (6) $-7.6y^2 + 2.3y^2$
           (2) $3mn + 5mn$ (7) $7x-3y + 2z - x+4y + 6z$
           (3) $7a^2b + 13a^2b$ (8) $3c - 2\frac{1}{2}f + 5\frac{1}{2}c - 6\frac{1}{2}c$
           (4) $2m + (-7m)$ (9) $3x^2 - 4x + 6 + 4x - 3 + x^2$
           (5) $-5m - (-7m)$ (10) $bx + 2b^2x - 7bx + 6 - b^2x$

VII. Elementary algebra

VII. B. 1. d)

Add

(11) $2x + 5y$
     $4x + y$

(12) $2a - 6b$
     $7a + 3b$

(13) $x^2 - 33x + 15$
     $-4x^2 + 18x - 36$

Add/Subtract (apply rules for operations on fractions)

(14) $\dfrac{a}{c} + \dfrac{b}{c}$

(18) $\dfrac{a}{b} + \dfrac{c}{d}$

(22) $\dfrac{c}{3} - \dfrac{c}{9}$

(15) $\dfrac{2a}{5} + \dfrac{3a}{5}$

(19) $\dfrac{2c}{3} + \dfrac{5c}{9}$

(23) $\dfrac{2r}{5} - \dfrac{r}{10}$

(16) $\dfrac{5}{a} + \dfrac{4}{a}$

(20) $\dfrac{9}{b} - \dfrac{3}{b}$

(24) $c - \dfrac{c}{2}$

(17) $\dfrac{7}{15a} + \dfrac{4}{15a}$

(21) $\dfrac{3a}{n} - \dfrac{2a}{n}$

(25) $\dfrac{3c}{4} - \dfrac{4c}{9}$

VII. B. 2. ACTIVITIES: 2. Multiply two or more monomials.

1) $3(2b)$

6) $(-3)(-y^4)(-u^2)$

2) $(-5c)(7c)$

7) $(-9c)(8cd^2)$

3) $(2x)(-4y)$

8) $(2r^2s^3)(3r^3s^2)(-r^5s)$

4) $(3t)(t^2)$

9) $(7x)(-2t)(4z)$

5) $(3a)(2b)(-10c)$

10) $(12b)(-\tfrac{1}{2}c)$

Multiply (apply rules for multiplying fractions).

11) $\dfrac{1}{a} \cdot 8$

16) $\dfrac{1}{a} \cdot \dfrac{2}{3}$

12) $\dfrac{7}{13} \cdot n$

17) $\dfrac{1}{6} \cdot \dfrac{6}{3}$

13) $3\dfrac{1}{7} \cdot \dfrac{m}{3}$

18) $\dfrac{2}{a} \cdot \dfrac{a}{8}$

14) $\dfrac{c}{2} \cdot 1\dfrac{2}{3}$

19) $\dfrac{5}{d} \cdot \dfrac{2d}{15}$

15) $\dfrac{2}{3m} \cdot 3\dfrac{2}{5}$

20) $\dfrac{3a}{4} \cdot \dfrac{5b}{6}$

VII.   Elementary algebra

VII. B. 3.   3. Multiply a polynomial by a monomial (Distributive
                               Property).

    1) $3(4c + 2d)$ 6) $3d(d^2 - 2d + 4)$

    2) $10(2b - \frac{1}{5} f)$ 7) $-2(4a + 7b)$

    3) $4x(-2x + 5)$ 8) $-7a^2b(-2ab + 2ab^2)$

    4) $-6c(3c - 2c^2)$ 9) $\frac{3}{4}(8f + 12g)$

    5) $mn(m + n)$ 10) $-9e(4 - 2e - 6e^2)$

VII. B. <u>ACTIVITIES</u>: 4. Divide a monomial by a monomial.

    1) $x^6 \div x^3$ 6) $n^{10} \div n^8$

    2) $t^{12} \div t^4$ 7) $2^5 \div 2^2$

    3) $\dfrac{e^9}{e^4}$ 8) $x^{5a} \div x^{2a}$

    4) $\dfrac{z^6}{z^6}$ 9) $\dfrac{s^x}{s^2}$

    5) $3^4 \div 3$ 10) $\dfrac{-35x^6}{7x^3}$

    Divide (apply rules for dividing fractions).

    11) $\dfrac{d}{5} \div d$ 16) $\dfrac{1}{a} \div \dfrac{1}{6}$

    12) $\dfrac{2}{m} \div 6$ 17) $\dfrac{8a}{12} \div \dfrac{4}{6a}$

    13) $2\dfrac{1}{8} \div \dfrac{c}{8}$ 18) $\dfrac{c}{3} \div \dfrac{5c}{9}$

    14) $5\dfrac{1}{2} \div \dfrac{2}{3c}$ 19) $\dfrac{6a^2}{54} \div \dfrac{3a}{9}$

    15) $4\dfrac{1}{6} \div \dfrac{m}{s}$ 20) $\dfrac{3w}{c} \div \dfrac{6w}{5c}$

                          21) $\dfrac{12a^6b^6c^6}{3a^4b^2c}$

VII.   Elementary algebra

VII. C.   ACTIVITIES: C. GCF, LCM

VII. C. 1.   1. The general method for determination of the
                               GCF using monomials is as follows:

                               Example:

                               a) Factor each expression.

                               b) Write all the factors which are common
                                   and use the smallest power of each.

$$25a^2b = 5^2 \cdot a^2 \cdot b$$
$$10a^3 = 2 \cdot 5 \cdot a^3$$
$$15a^2 = 3 \cdot 5 \cdot a^2$$
$$\text{GCF} = 5 \cdot a^2 = 5a^2$$

VII. C. 2.   2. Find the LCM. Write all of the factors.
                               Use the largest power of each.

Example: $5a^2b = 5a^2b$
$$10abc = 2 \cdot 5abc$$
$$25ab^2c^3 = 5^2ab^2c^3$$
$$\text{LCM:}\quad 2 \cdot 5^2a^2b^2c^3 = 50a^2b^2c^3$$

a) $36x^2yz^3 = 2^2 \cdot 3^2x^2yz^3$
$$\underline{27x^2y^3z = 3^3 \cdot x^2y^3}$$
$$\text{LCM:}\ 2^2 \cdot 3^3 \cdot x^2y^3z^3 = 108x^2y^3z^3$$

VIII. Linear Equations and Inequalities of One Variable

VIII. A.   CONTENT: Linear equations; Properties of equality

           OBJECTIVE: The student will use the axioms of equality.

           ACTIVITIES: Identify each of the following as reflexive (a=a),
                        symmetric (if a=b, then b=a), or transitive (if
                        a=b and b=c, then a=c).

                        a) $3 = 3$
                        b) If $a = b$ and $b = 5$, then $a = 5$
                        c) If $5 = x$, then $x = 5$
                        d) If $m = 2 + 5$ and $2 + 5 = 7$, then $m = 7$

                        e) $-\dfrac{2}{5} = -\dfrac{2}{5}$

                        f) If $2 \cdot 6 = 12$, then $12 = 2 \cdot 6$

VIII.   Linear equations and inequalities of one variable

VIII. B.   CONTENT: Linear equations; Solution of linear equations
                       in one variable.

           OBJECTIVE: The student will be able to solve equations

                       1. Involving only one operation.
                       2. Involving more than one operation.
                       3. Having variables on both sides.

VIII. B. ACTIVITIES: Solve.
1., 2., and 3.

                       1. a) x + 2 = 5   k) $\frac{w}{3}$ = 6

                           b) y + 6 = -11   1) $\frac{r}{6}$ = -42

                           c) m + 12 = 20   2. m) 3x + 2 = 17

                           d) a - 3 = 4   n) 2 = 8 - 6y

                           e) n - 6 = -9   o) $\frac{3}{4}$ a + 4 = 22

                           f) p - 15 = 32   p) 5m - 8m = -12

                           g) 3q = 24   3. q) 12d-5 = 8d+3

                           h) -4n = 28   r) 5y+12 = -15-4y

                           i) $\frac{2}{3}$ c = -18   s) -6b+14 = 2b+

                           j) $\frac{a}{12}$ = 2   t) 4d = 8d+20

VIII. C. CONTENT: Linear equations; Graphing

           OBJECTIVE: The student will be able to use a rectangular
                       coordinate system to

                       1. Locate and relate points in the plane to
                           ordered pairs of numbers.

                       2. Graph linear equations in two variables.

VIII. C. ACTIVITIES: 1. Graph each ordered pair.
1.
                           a) (-3,0)   f) (0,2)
                           b) (-2,3)   g) (4,-2)
                           c) (5,0)   h) (-2,-1)
                           d) (1,4)   i) (0,0)
                           e) (0,-3)

                           Does the point lie in a quadrant or on an
                           axis? Which quadrant or which axis?

VIII. Linear equations and inequalities of one variable

VIII. C. 2.   2. Draw a coordinate system and graph.

                                   a) $2x + y = 4$
                                   b) $3x - 2y = -6$
                                   c) $-5y = -x + 10$
                                   d) $y = -2$
                                   e) $x = 3$

VIII. D. <u>CONTENT:</u>   Linear equations; Problem solving

          <u>OBJECTIVE:</u>   The student will be able to

                                1. Translate verbal expressions to algebraic
                                    expressions and vice versa.
                                2. Use linear equations to solve word problems
                                    involving number relations such as number,
                                    consecutive integer, geometry, distance,
                                    coin, and age problems.

VIII. D. <u>ACTIVITIES:</u>   1. Translate each word phrase into an algebraic
1.   expression.

                                    a) (1) The sum of b and 8
                                        (2) x decreased by y
                                        (3) The product of m and n
                                        (4) 12 increased by 8
                                        (5) 5 less than t
                                        (6) 3 more than twice c
                                        (7) 6 less tnan four times m
                                        (8) Seven diminished by the sum of 2 and x
                                        (9) Five times the sum of 2 and y
                                       (10) The square of the product of 3 and x
                                       (11) The square of the sum of 3 and x

                                    b) Translate each algebraic expression
                                        into words.

                                        (1) $5 + n$
                                        (2) $3 - x$
                                        (3) $(a+b)$
                                        (4) $5p - 3$

VIII. D. 2.   2. a) Number problems

                                        (1) The sum of twice a number and 16 is
                                             86. Find the number.
                                        (2) Seventeen less than three times a
                                             number is 43. What is the number?

                                        b) Consecutive integer problems

                                        (1) The sum of two consecutive integers
                                             is 35. What are the integers?

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VIlI.   Linear equations and inequalities of one variable

        (2) The sum of three consecutive odd
            integers is 105. Find the integers.
        (3) Find three consecutive even integers
            such that four times the greatest
            decreased by five times the least
            is 26.

VIII. D. 2.   c) Geometry problems

        (1) The length of a rectangle is 3cm more
            than twice the width. If the perimeter
            of the rectangle is 30cm, find the
            dimensions of the rectangle.
        (2) The perimeter of a triangle is 22m.
            The length of one side of the triangle
            is three more than twice the length
            of the first side. The third side
            is two less than four times the
            first side. Find the length of
            each side.

                              d) Distance problems

        (1) Two trains leave the same station
            at the same time and travel in
            opposite directions. If their
            rates are 5) mi/hr and 60 mi/hr,
            in how many hours will they be 660
            miles apart.
        (2) A salesman made a 375 mile trip by
            traveling 3 hours by bus and 4 hours
            by train. The train's average
            speed was 15 mi/hr more than the
            average speed of the bus. Find the
            rates of each.

                              e) Coin problems

        (1) Hilda has $2.15 in dimes and
            quarters. If she has four more
            dimes than quarters, how many
            dimes does she have?
        (2) A soft drink machine takes
            nickels, dimes, and quarters.
            If a week's receipts of $21.30
            contains 17 more dimes than
            quarters and 24 fewer nickels
            than quarters, how many nickels
            did the machine contain?

VIII.   Linear equations and inequalities of one variable

       f) Age problems

          (1) Bob is 3 years more than twice as
              old as Emma. If the sum of their
              ages is 39, what is the age of each?

          (2) Jack's father is 4 times as old as
              Jack is now. In 5 years, he will
              be 3 times as old as Jack will be
              then. How old is Jack now?

VIII. E. **CONTENT:**   Solutions of inequalities in one variable.

    OBJECTIVE: The student will be able to:

        1. Find the solution set of a linear inequality
           in one variable.

        2. Graph the solution set of a linear inequality
           in one variable.

    ACTIVITY: Solve and graph these inequalities.

       (1) $x + 2 \geq 5$
       (2) $x + 2 > 5$
       (3) $x - 3 < 16$
       (4) $x - 7 > -2$
       (5) $x + 7 \leq -1$
       (6) $2x \leq 10$
       (7) $6x > -24$
       (8) $-8x < 32$
       (9) $-5x \geq -20$
    (10) $2x \geq 7$
    (11) $2x + 3 \geq 8$
    (12) $4x - 1 \leq 13$
    (13) $x + \frac{1}{2} < 7$
    (14) $x - \frac{1}{2} > -3$
    (15) $3x + \frac{3}{4} < -6\frac{1}{2}$

IX. A.   **CONTENT**:   Probability and statistics; Graphs

      OBJECTIVE: The student will be able to:

1. Interpret information presented in maps, charts, and tables.
2. Construct, interpret and use data from pictographs, bar graphs, circle graphs and line graphs.

IX. A.   **ACTIVITIES**:   1. and 2.   a)   Use the table below to answer the
1. and 2.   questions.

Job Opportunities in the Twenty-first Century	
JOB	Number of Persons Needed
Robot Technicians	4,750,000
Disease Researchers	3,465,000
Stress Consultants	2,750,000
Physical Fitness Experts	5,000,400

(1) What is the total number of job opportunities listed in the chart?

(2) What percentage of the total number of job opportunities is the number of persons needed for robot technicians?

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IX. A. 1. and 2.   b) Use the data in the tables below to construct:

(¹) A bar graph showing the number of hours spent studying various subjects each week.

Subject	Hours Spent
Algebra I	5
Biology	3½
Civics	2
English I	4
French I	2½

(2) A pictograph.

PROJECTED NUMBER
OF CAR SALES IN 1995

Kind of Car	Projected Sales
Isuzu	435,000
BMW	150,000
Peugeot	340,000
Ford Escort	260,000
Yugo	380,000

(3) A double line graph showing the number of students enrolled in two different schools.

Grade	Vo Tech	Magnet High
9	400	350
10	360	400
11	320	430
12	280	360

c) Use the circle graph below to answer the following questions about items A, B, C, D, and E.
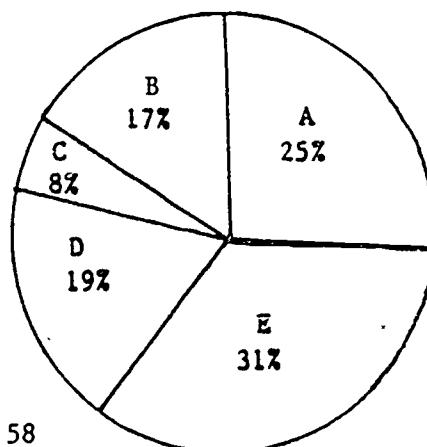
B 17%
A 25%
C 8%
D 19%
E 31%
Total Sales
1000 items

58

74

IX. Probability and statistics

IX. A. 1. and 2.   c) (1) What percent of items A and C were
                              sold?

                       (2) The sale of items C and D exceeded the
                              sale of item A by what percent?

                       (3) The total number of sales for item F was?

      d) Use the bar graph below to answer the
         following questions.

Teachers Lawyers Nurses Engineers
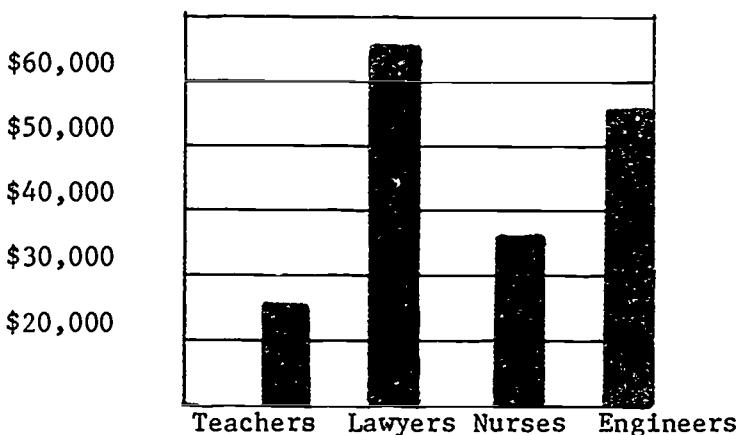
(1) What is the highest paid group?

(2) Which groups earn less than $40,000
yearly?

(3) Engineers earn approximately how many
thousand dollars less than lawyers?

IX. B. CONTENT: Probability and statistics; Probability

       OBJECTIVE: The student will be able to:

1. Find the probability involved in a coin
toss, the roll of a die, a turn of a
spinner, or a draw of marbles or cards.
2. Interpret probability statements encountered
in everyday situations.

IX. B. ACTIVITIES: 1. Complete the following.
1. and 2.

              (a) Flip a coin.

                  (1) Are the outcomes equally likely?
                  (2) P(Heads)
                  (3) P(Tails)

IX. Probability and statistics

IX. B. 1. and 2.   b)
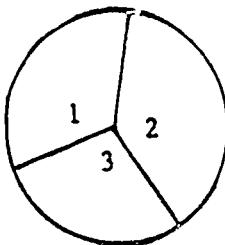
Spin the spinner.

(1) Are the outcomes equally likely? _____
(2) P(1) = _____
(3) P(2) = _____
(4) P(3) = _____

c) A cube is numbered from 1 to 6 on
each of its sides. What is the pro-
bability of each of the following
outcomes when the cube is tossed?

(1) P(1)
(2) P(2)
(3) P(5)

d) A drawer contains six blue bows, four green
bows, and two red bows. Two bows are drawn
at random without replacement. If a blue
bow is drawn first, determine the probability
for the second draw.

(1) P(blue) _____
(2) P(green) _____
(3) P(red) _____

IX. C. CONTENT: Probability and statistics; Statistics

OBJECTIVE: The student will be able to find the mean,
mode, median, and range of a set of data.

ACTIVITIES: Find the mean, mode, median, and range of
each given set of data.

a) 24 ft., 36 ft., 26 ft., 36 ft.

b) 9.4 mi., 10.1 mi., 9.4 mi., 9.2 mi.

IX.   Probability and statistics

IX.   C.   c)

Test Scores on Pre-Algebra							
Week	1	2	3	4	5	6	7
Percent	86%	92%	94%	84%	92%	83%	85%

IX.   D.   CONTENT: Probability and statistics; Problem solving

OBJECTIVE: The student will be able to solve word problems
involving graphs, probability, or statistics.

ACTIVITIES: Solve each.

a)   The attendance figures at the first four
games of the New Orleans Saints were:
64,530; 58,713; 62,971; and 64,234.
What was the mean attendance?

b)   Ticket prices for the home games were as
follows: $10.00, $12.00, $15.00, and
$25.00. What is the median price of a
ticket?

c)   Write mean, mode, median, or range to
complete the sentence.

(1) $23 + 27 + 16 + 26 = 92$
$92 \div 4 = 23$
The _____ is 23.

(2)   102, 120, 130, 135
$(120 + 130) \div 2 = 125$
The _____ is 125.

(3)   123, 144, 126, 123, 187
The _____ is 123.

(4)   123, 144, 126, 123, 187
$187 - 123 = 54$
The _____ is 54.

IX. Probability and statistics

IX. D.   d) The circle graph below shows the voting
                              status of 185,000 people eligible for
                              voting in the capitol city for the
                              Governor's race.

Voted at the polls

Not
registered

26.7%

47.5%

6.8%   Cast
        absentee
        ballots

19%

Registered but
did not vote
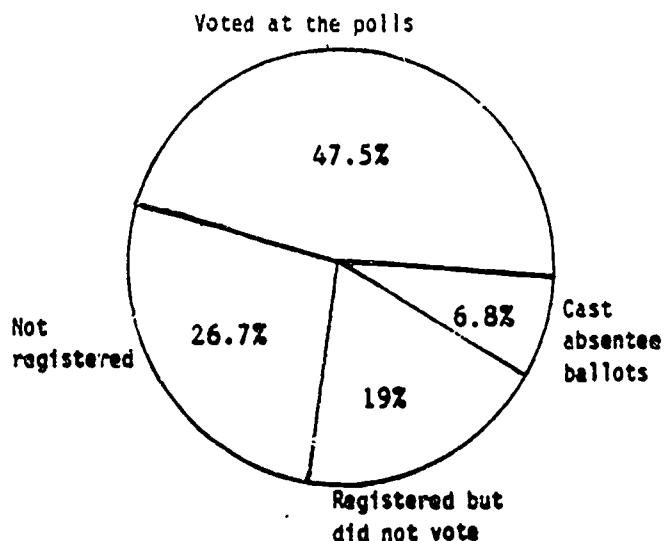
(1) How many people voted in the capitol
     city Governor's race?
(2) Approximately how many people were
     not registered to vote?
(3) How many people cast absentee votes?

e) There are 100 chips in a sack. Of these,
    50 are black, 30 are white,and 20 are red.
    You draw one chip without looking. State
    each probability below as a ratio and as a
    percent.

    (1) P(black)
    (2) P(black or white)
    (3) P(blue)

X.   Geometry

X.   A.   CONTENT: Geometry; Points, lines, planes

            OBJECTIVES: The student will be able to:

                          1. Give an example of
                              a) Point
                              b) Line
                              c) Plane
                          2. Draw and label a
                              a) Ray
                              b) Line segment

X.   A. 1. ACTIVITIES: 1. Give an example of a
                              a) Point
                              b) Line
                              c) Plane
X.   A. 2.   2. Draw and label a
                              d) Ray
                              e) Line segment

X.   B.   CONTENT: Geometry; Angles

            OBJECTIVE: The student will be able to:

                          1. Define and classify angles as acute, obtuse,
                              right, or straight.
                          2. Identify congruent angles.
                          3. Recognize that the sum of the measure of
                              the interior angles of a triangle is 180°.
                          4. Measure and draw angles using a protractor.
                          5. Construct an angle using a straight edge
                              and compass.

X.   B. 1. ACTIVITIES: 1. Rotate two strips of heavy paper attached
                              with a brad (metal fastener) to show the
                              various angles. Have students practice
                              identifying the types and/or have students
                              show various angles. Use a protractor to
                              measure each angle.
X.   B. 2.   2. Have students draw an angle then construct
                              a copy of that angle. They should check
                              their work by using a protractor to measure
                              the angles.
X.   B. 3.   3. Have students draw two different triangles.
                              Have them use a protractor to measure each
                              angle inside the triangle and find their
                              sum. Then have each student give their
                              findings orally.

X. Geometry

X. B. 4.   4. On paper, have students construct a dupli
                               cate of a given angle with identical meas_
                               (using a protractor).

X. B. 5.   5. Activity #4 may be used if compass and
                               straightedge are substituted for pro-
                               tractor.

X. C.   CONTENT: Geometry; Circles

         OBJECTIVES: The student will be able to:

                           1. *Identify the parts of a circle.
                           2. *Recognize and use π in fraction or
                              decimal form.
                           3. *Determine the area and circumference
                              of a circle.

XI. C. 1. ACTIVITIES: 1. Draw the figure below on the chalkboard.
                               Have students reproduce the figure on
                               paper. As a group, define and label
                               each part.

                               Example:
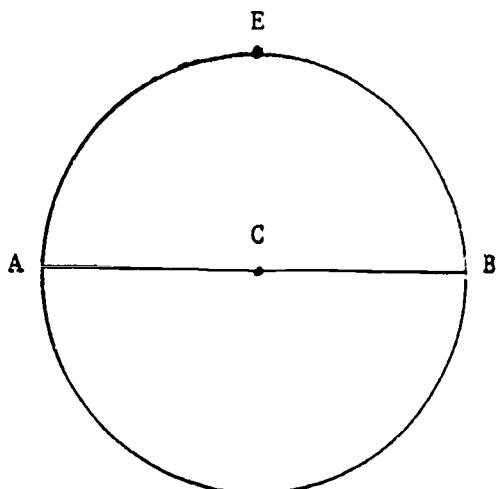
X. Geometry

X. C. 2. and 3.   2. and 3. a)   Have students constr... ... ...
                                         construction paper a:d cut
                                         Using a ruler, students ... ...
                                         the diameter and recora t...: answe

                       Using this information, have stud..:: ...

                       the circumference (C=π) using both $\frac{22}{7}$

                       3.14 as numerical values for π.

                       Example: a) D = 12 inches

                                         $C = \frac{22}{7} (12)$

                                         $C = 3.14(12)$

                       Repeat the same procedure to determ:.. ..
                       circumference using the radius.

                       Example: R = 6 inches

                                         $C = 2 \left(\frac{22}{7} \right)(12)$

                                         $C = 2(3.14)(12)$

                       As an extended activity, have s: ... ts
                       use a length of string to measur. ..
                       distance around the circle. · ve .. .
                       compare the results from this mec:od .
                       the results using the formula.

X. Geometry

X. D.   CONTENT: Geometry; Polygons

         OBJECTIVE: The student will be able to:

                       1. a) Define regular polygons.

                           b) Identify and classify 3 to 10 sided
                               polygons.

                       2. a) Define irregular polygon.

                           b) Construct irregular polygons.

         ACTIVITIES: 1. Fill in the chart with the definitions and
                           indicated figures. (A form for this
                           activity is included in the appendix.)

X. Geometry

Regular Polygon:			
Irregular Polygon:			
Number of Sides: 3	4	5	6
Type ↓			
Regular			
Irregular			
7	8	9	10
Sides→			
Regular			
Irregular			

              2. Identify "real-life" objects in the regular
                  polygon categories. (Ex.: stop-sign-octagon)

X. E.   CONTENT: Geometry; Triangles

          OBJECTIVES: The student will be able to:

                          1. Identify the attitude and base of a
                              triangle.
                          2. Classify triangles according to sides.
                          3. Classify triangles according to their
                              angles.
                          4. Identify the parts of a right triangle.
                          5. *Determine the area of a triangle.
                          6. *Use the Pythagorean Rule.

X. E.   ACTIVITIES: 1. 2. 3. & 4. After defining the three types of
1., 2., 3., and 4.   triangles (scalene, isoceles, equilateral),
                                        have students use construction paper to make
                                        models of triangles with suggested lengths
                                        and record them in a chart similar to the one
                                        below.

Triangle	Lengths of sides (cm)		
Scalene	12	16	20
Isoceles	20	20	30
Equilateral	12	12	12

X.   Geometry

                          Complete the activity by allowing students
                          to measure the base and altitude of each.

                          Extension: First have students use pro-
                          tractors to measure each angle within the
                          triangle and label them as acute, right, and
                          obtuse. Second, after determining which of
                          the triangles is a right triangle, have
                          students label the parts.

X. E. 5.

5. Have students cut a square (of designated measurements) out of construction paper. They are then to calculate the area of the square using the appropriate formula (A=L·W). They should then be directed to fold the square diagonally to form a triangle. Have students measure the base and height (altitude) of the triangle.

X. E. 5.

Then have them compute the area of the triangle using the formula $A = \frac{b \cdot h}{2}$ or

$A = \frac{1}{2}(b \cdot h)$. Compare the area of the triangle to the area of the square. Remind the students that they made the triangle by folding the square in half. Does the calculated area agree with this; e.g., does the area of the triangle equal half the area of the square?

X. E. 6.

6. The lengths of the sides of a triangle are given. Is the triangle a right triangle? (c is length of hypotenuse)

   a) $a = 9$, $b = 12$, $c = 15$
   b) $a = 4$, $b = 5$, $c = 6$
   c) $a = 10$, $b = 15$, $c = 20$
   d) $a = 10$, $b = 24$, $c = 26$

X. F.   CONTENT: Geometry; Quadrilaterals

OBJECTIVES: The student will be able to:

1. Identify types of quadrilaterals.
2. Identify the altitude and base(s). of a trapezoid and parallelogram.
3. Determine the area of quadrilaterals.

X. Geometry

X. F.	ACTIVITIES:	1. and 2. First, have students draw representations
1. and 2.		of the five types of quadrilaterals and
		label their drawings. Then, have students
		draw and label the altitude and base(s)
		of a trapezoid and a parallelogram.

X. F. 3.   3. Have students, using the appropriate formula,
                     determine the area of each figure and com-
                     pare the procedures.

a) A trapezoid with b_1 = 4cm, b_2 = 2cm,
    h = 5cm
b) A square with S = 5 ft.
c) *A parallelogram with b — 6m, h = 8m
d) A rectangle with l = 6 in, w = 2 in.

X. G. CONTENT: Geometry; Similar and congruent figures

        OBJECTIVE: The student will be able to recognize similar
                      and congruent figures.

X. G. ACTIVITIES: a) In a container, put multiple copies of
                          various figures. Have students select
                          several figures and determine which of
                          these are congruent and which are similar.

                      b) Have students cut out a variety of given
                          shapes. Working in groups of three or
                          four, have students determine which
                          shapes are similar and which are con-
                          gruent.

X. H. CONTENT: *Geometry; Problem solving

        OBJECTIVES: The student will be able to solve problems

                      1. Involving volume of spatial figure .
                      2. Involving the conversion of area measures.

X. H. 1. ACTIVITIES: 1. Solve the following:

                      a) A cone and a cylinder both have a
                          radius of 25 cm and a height of 30 cm.
                          What is the volume of the cone? Of
                          the cylinder?

                      b) A pyramid has a square base 8m on
                          each side and a height of 10m. Find
                          its volume.

                      c) A sphere has a radius of 6 inches. What
                          is its volume?

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X. Geometry

d) A cube is 8 cm. on each side. A rectangular solid has a length of 8 cm, a width of 4 cm, and a height of 5 cm. What is the volume of the cube? Of the rectangular solid?

X. H. 2.   2. a) How many square yards are there in a rectangular field that is 540 ft. long and 242 ft. wide?

b) A table top has the shape of a trapezoid with one base of 108 cm, another of 154 cm, and a height of 247 cm. Find the area of the table top in square meters.

EVALUATION TECHNIQUES

The importance of regular and frequent evaluation is nowhere more obvious than in the area of mathematics where skills are built in a cumulative manner. Frequent short quizzes should be used to determine understanding and mastery of each concept as it is taught. Longer tests covering related concepts and their relevance in problem solving should be administered at the conclusion of each unit. Comprehensive examinations covering all concepts and skills are very important at the end of each semester and at the end of each year. The sample items in the activities section of this guide represent ideas for examination problems but are by no means recommended for use as they are presented in this book. These evaluative techniques are to be used to measure the degree of achievement by the students with the understanding that there are many other types of tools for the measurement of student progress in achieving curricular objectives.

A basic goal in teaching mathematics should be to aid the student in becoming a competent problem solver. It is not enough to teach mathematical skills. The student must also be provided an opportunity to practice the application of these mathematical skills to successfully solve problems. The student's ability to solve problems logically should be evaluated regularly since it is a lifetime skill which carries over into all areas of living.

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STATE-APPROVED TEXTBOOKS

Grade Eight:[1]

Addison-Wesley Mathematics. Book 8. Addison-Wesley: 1985.

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Harper and Row Mathematics Series. Grade 8. Harper & Row: 1985.

Heath Mathematics Series. Grade 8. Heath: 1985.

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Using Mathematics 8. Laidlaw Brothers: 1984.

Series M: Macmillan Mathematics. Grade 8. Macmillan: 1985.

Invitation to Mathematics. Grade 8. Scott, Foresman: 1985.

Mathematics II[2]:

Essentials for Algebra: Concepts and Skills. Houghton-Mifflin: 1984.

Preparing to Use Algebra. Laidlaw Brothers: 1984.

Mathematics for Everyday Life. Charles E. Merrill: 1978.

Pre-Algebra: A Problem Solving Approach. 1st ed. Charles E. Merrill: 1982.

[1]The 8th grade text shown on the State adopted list will provide material related to the basic mathematics skills. Material for the elementary algebra concepts (Ex.: polynomials) will need to be provided from other resources.

[2]Math II (Pre-Algebra) texts, at the time, are generally geared toward a high school remediation program.

At this time, publishers are working on "introductory algebra" (Pre-Algebra) textbooks for "accelerated" programs.

    Ex.: 1) Pre-Algebra, An Accelerated Course. Houghton-Mifflin.

        2) Pre-Algebra. Heath.

(These are not yet on the State list.)

Algebra I - Low Track:

Algebra in Easy Steps. American.

Introductory Algebra 1. 4th ed. Harcourt: 1982.

Basic Algebra Houghton-Mifflin: 1977.

Elementary Algebra, Part 1. Houghton-Mifflin: 1983.

Elementary Algebra, Part 2. Houghton-Mifflin: 1983.

SUPPLEMENTS

*Algebra - Basic Skills. Workbook J. ESP, Inc., by Bearl Brooks: 1982.

*Algebra: An Introductory Course. Amsco School Publishing, Inc.: 1987.

*Algebra I, A Review Guide. Amsco School Publishing, Inc.: 1966.

Algebra I: Expressions, Equations and Applications. Amsco School Publishing. 1984.

Algebra I. Revised Edition. Houghton Mifflin Co. 1983.

Algebra: Know the Essentials Of. Hayes Publishing Co. 1968.

Algebra ½, An Incremental Development. Grassdale Publishers, Inc. 1983.

Developing Skills in Algebra I. Series - A,B,C,D. Dale Seymour Publications, P. O. Box 10888, Palo Alto, CA. 94300

Introduction to Algebra. Series I and II. Guid Association Publishing. 1979.

*Pre-Algebra with Pizzazz! Creative Publications. Palo Alto, CA. 94300.

Pre-Algebra. Houghton Mifflin Company. 1981.

Pre-Algebra - Know the Essentials Of. Hayes School Publishing Co. 1985.

*Highly recommended as resource for compiling supplemental material.

APPENDIX

1.	prime number	48.	ray
2.	composite number	49.	line segment
3.	base	50.	angle
4.	exponent	51.	adjacent angles
5.	square root	52.	complementary angles
6.	absolute value	53.	supplementary angles
7.	real numbers	54.	vertical angles
8.	rational numbers	55.	parallel lines
9.	integers	56.	perpendicular lines
10.	whole numbers	57.	transversal
11.	natural numbers	58.	corresponding angles
12.	term	59.	alternate interior angles
13.	like terms	60.	alternate exterior angles
14.	monomial	61.	circle
15.	binomial	62.	polygon
16.	trinomial	63.	radius
17.	polynomial	64.	diameter
18.	greatest common factor	65.	circumference
19.	least common multiple	66.	semi-circle
20.	equation	67.	chord
21.	linear equation	68.	arc
22.	inequality	69.	regular polygon
23.	open sentence	70.	irregular polygon
24.	replacement set	71.	altitude
25.	root	72.	base
26.	solution set	73.	triangle
27.	reflexive property	74.	scalene triangle
28.	symmetric property	75.	isosceles triangle
29.	transitive property	76.	equaliteral triangle
30.	rectangular coordinate system	77.	right triangle
31.	ordered pair	78.	hypotenuse
32.	horizontal axis	79.	leg
33.	vertical axis	80.	quadrilateral
34.	origin	81.	perimeter
35.	quadrants	82.	area
36.	abscissa	83.	volume
37.	ordinate	84.	circumference
38.	probability	85.	rectangle
39.	statistics	86.	trapezoid
40.	mean	87.	parallelogram
41.	median	88.	rhombus
42.	mode	89.	square
43.	range	90.	cube
44.	geometry	91.	rectangular solid
45.	point	92.	pyramid
46.	line	93.	sphere
47.	plane	94.	cone

95. cylinder
96. sum
97. difference
98. product
99. quotient
100. Associative Property
101. Commutative Property
102. Distributive Property
103. Additive Identity Property
104. Multiplicative Identity Property
105. Closure Properties
106. Additive Inverse Property
107. Multiplicative Inverse Property
108. Multiplicative Property of Zero
109. Property of Substitution
110. factors
111. scientific notation
112. coefficient
113. variable
114. pentagon
115. hexagon
116. heptagon
117. octago
118. nona
119. deca
120. ratio
121. simple interest
122. compound interest
123. interest
124. principal
125. rate
126. pi
127. pythagorean rule
128. $+$
129. $-$
130. $\cdot$
131. $\div$
132. $=$
133. $>, \geq$
134. $<, \leq$
135. π
136. Grouping symbols: $\{ \} \ (\ ) \ [\ ] \ \underline{\quad}$ (horizontal bar, e.g., $\frac{2}{3}$
137. $\approx$
138. $\cong$
139. $\| \ \|$
140. $\perp$
141. $|a|$
142. $\sqrt{}$
143. Δ
144. $\doteq$
145. $\neq$

SUBSETS OF REAL NUMBERS

Real Numbers - {the coordinate of a point on a numberline}

Natural or Counting Numbers - {1, 2, 3, 4, 5, 6, 7, 8, 9...}

Whole Numbers - {0, 1, 2, 3, 4, 5, 6, 7, 8...}

Integers - {...-2, -1, 0, 1, 2, 3...}

Rational Numbers - {any number in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$}

Irrational Numbers -{non-terminating, non-repeating decimal numbers}

REAL   NUMBERS

Rational numbers

$\frac{3}{6}$, $\frac{4}{5}$, $\frac{12}{8}$

Irrational
numbers

$\sqrt{2}$, π

$\sqrt{23}$

Integers   -14, -6, -1, 0, 1, 8, 13, 16

Whole numbers

0, 7, 11, 20, 37

1,2,
3,4,5,
6,7,8...

Natural numbers
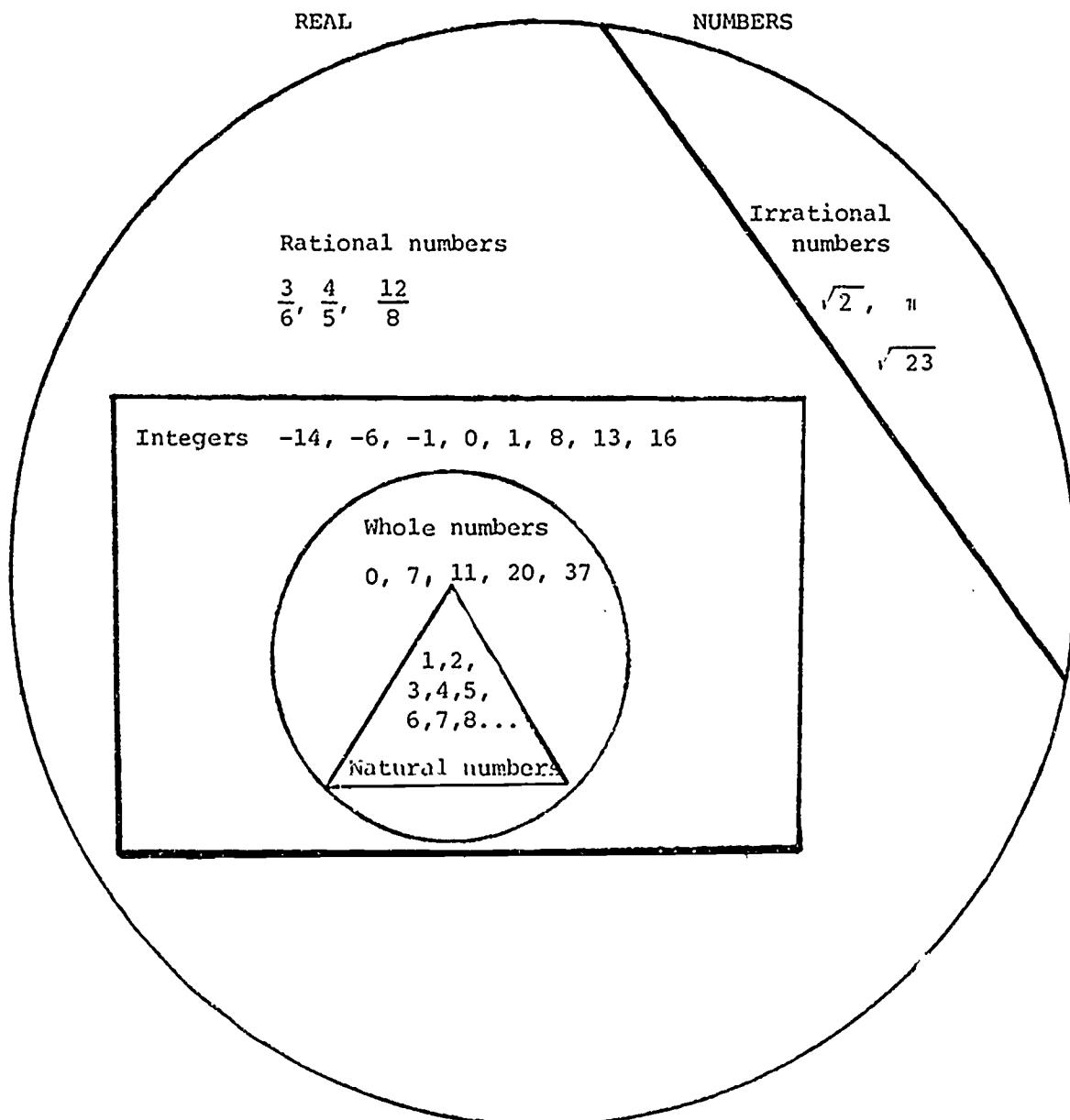
EXTRACTING SQUARE ROOT

PROBLEM —— $X^2 = 673.8$ OR $X = \sqrt{673.8}$

PROCEDURE ——

$$
\begin{array}{c}
20 \\
\times 2 \\
\hline
40 \\
+ 5 \\
\hline
45 \times 5
\end{array}
$$

$$
\begin{array}{c}
25 \\
\times 20 \\
\hline
500 \\
+ 9 \\
\hline
509 \times 9
\end{array}
$$

⑧

$$
\begin{array}{c}
259 \\
\times 20 \\
\hline
5180 \\
+ 5 \\
\hline
5185 \times 5
\end{array}
$$

Long division layout:

```
          ⑦  ①   ②
④→      2 : 5 . 9 : 5 :
      √ 6 :73 .80 :00 :
③→      4 :    :    :
⑥→  ← 40
⑤→     2 :73 :    :    :
45 × 5 →2 :25 :    :    :
        ─────
        48 :80 :
509 × 9 →45 :81 :
        ─────
5185 × 5 → 2 :99 :00 :
           2 :59 :25 :
           ─────
           39 :75 :
```
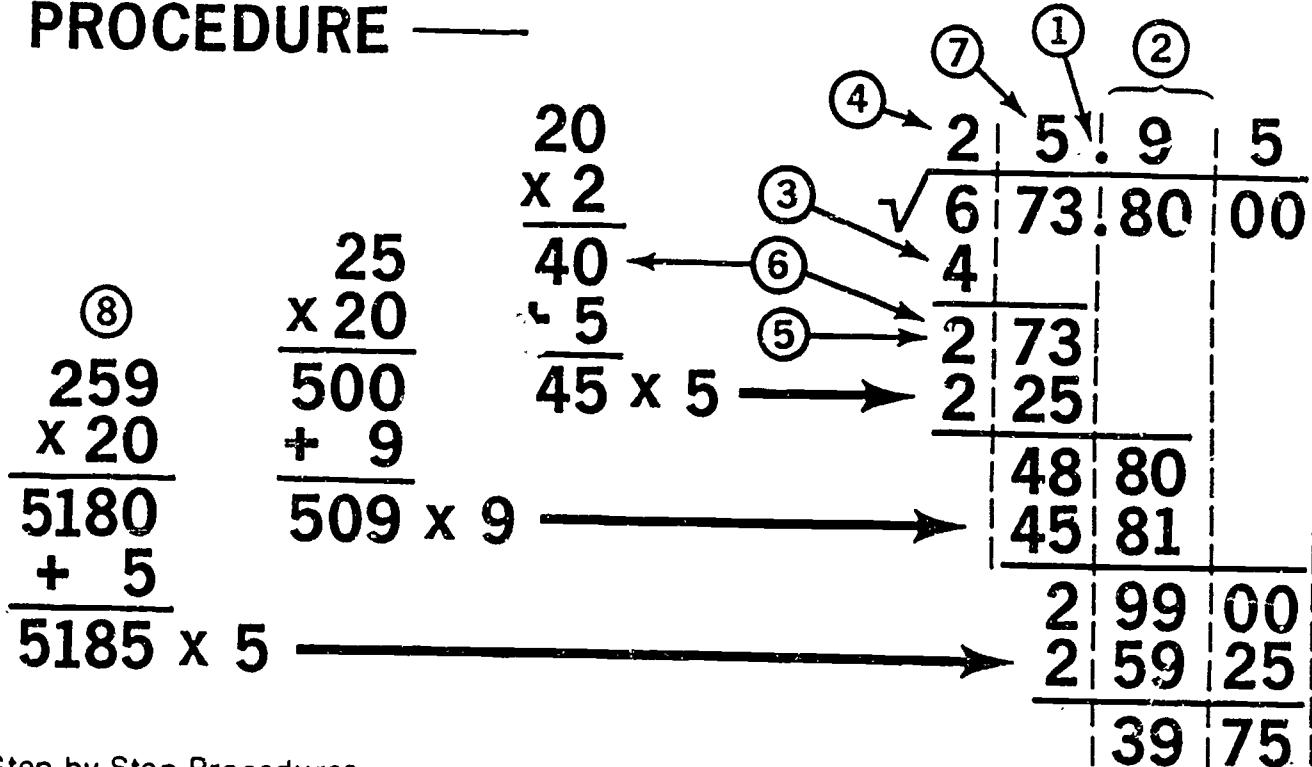
Step-by-Step Procedures

---

1. Place the decimal point directly over the decimal point in the number.
2. Beginning at the decimal point, separate the number into groups of two figures each, called Periods. Add zeros if needed.
3. Find the largest perfect square contained in the first period (6). The largest perfect square that can be subtracted from (6) is 4.
4. Write the 4 under the (6) and the square root of 4 (2) above the (6).
5. Subtract the perfect square 4 from the first period (6) and bring down the next period 73 to form the number 273.
6. Multiply the first number of the answer (2) by 20 to obtain a trial divisor of (40). Mentally divide the (40) into the remainder 273, to see about how many times it will go. It goes approximately 5 times.
7. Write the 5 above the next period to obtain an answer so far 25, then add the 5 to the 40 equalling 45. Multiply 45 by 5 and subtract the product from 273. The new dividend is 4380.
8. Repeat this process until you have gone past the last period.

PROBLEM-SOLVING PROCESS AND STRATEGIES
Introduction

The world that children will live in as adults will require that they acquire the skills to solve problems and to ask good questions. Mathematics should be taught so that mathematical concepts and skills make sense to the student. The emphasis on problems must come first; it is the starting place for developing arithmetic understanding and for establishing the need for computation. The student needs to see that developing computational skills serves a purpose--that computational skills are tools for solving problems.

The problem-solving process. The problem-solving process for mathematics has been described in a variety of ways, but at least four steps are identified in most models. These are:
1. <u>Reading</u> or understanding the problem
   --the student decides what s/he is trying to find and what information is needed or irrelevant.
2. <u>Devising a plan</u>
   --the student decides what problem-solving strategies are appropriate to use for the problem.
3. <u>Carrying out the plan</u>
   --the student uses selected strategies to compute the answer or solve the problem.
4. <u>Checking the answer</u>
   --the student reviews his/her answer to make sure that it is reasonable and verifies its accuracy.

It is clear from this description of the problem-solving process that mathematics instruction should be directed at teaching students "how to think." Students should be exposed when they are very young to problems that require thinking beyond rote response. To be effective in helping students to develop and sharpen their problem-solving skills, teachers should avoid illustrating all of the steps in the solution of numerical exercises. Instead, teachers should present relevant problems and guide students toward solutions rather than tell them the answers.

Asking good questions, for example, helps students go forward toward solutions. Allowing sufficient time for students to solve problems is also important; during this "wait time," the teacher does not talk, but allows students the opportunity to think or talk to one another. In general, students' exploration and discovery of solutions is more useful than passive reception of the answers in learning how to solve problems independently.

Problem-solving strategies. Research has shown that the teaching of specific problem-solving strategies greatly improves students' problem-solving abilities and results in dramatic increases in their scores on related tests. Strategies are not specific to particular problems or to particluar areas of the mathematics curriculum, but can be applied alone or in combination with other strategies to solve a wide variety of problems. Gaining familiarity with different strategies, seeing them modeled, and then trying to apply them can provide students with useful tools for tackling problems.

Although the list may not be comprehensive, the thirteen problem-solving strategies identified below constitute a good repertoire of strategies that can serve as a basis for solving problems in school and in life.

1. Uses common word problem strategies to solve problems.
2. Breaks problems into parts to solve two-step or multi-step problems.
3. Uses trial and error to solve problems (guess and check).
4. Uses dramatization to solve problems.
5. Uses concrete objects to solve problems.
6. Draws pictures or diagrams to solve problems.
7. Given relevant information, works backwards to solve problems.
8. Looks for patterns to solve problems.
9. Constructs and uses tables, lists, and charts to solve problems.
10. Solves a similar or simpler problem to help find a solution.
11. Constructs and interprets graphs to solve problems.
12. Writes simple equations to solve problems.
13. Uses logical reasoning to solve problems.

Examples of exercises designed to teach each of these thirteen strategies complete this section.

Suggestions for teaching problem solving. Presented below are a set of general suggestions for teaching problem solving.

1. Provide a wholesome emotional climate for problem solving.
2. Teach various problem-solving strategies.
3. Emphasize the method of solution rather than the solution.
4. Encourage experimentation, trial and error, estimation, intuition, guessing and hunches to suggest a method of solution.
5. Expose students to many problems and to varied problems so that they develop flexibility in problem-solving behavior.
6. Provide sufficient time for discussion, practice, and reflection on problems and problem-solving strategies.
7. Have students construct their own problems.
8. Attempt to find the source of the students' difficulty and use various instructional techniques to remove these difficulties.
9. Insist on persistent effort and on concentrated and sustained attention.
10. Provide very frequent short sets of problems on which the students experience absolute success.
11. Promote problem solving through the use of mathematical games and other activities.
12. Have students work together in small groups.
13. Attempt to establish and maintain students' motivation.
14. Show the learner how to ask him/herself questions.
15. Give conscious attention to reading skills.
16. Use problem situations to discover new mathematical concepts, principles, or relationships.
17. Use problem situations as a basis for practice and as a substitute for isolated drill exercises.
18. Model good problem-solving behavior.

Regular Polygon:

Irregular Polygon:

Number of Sides:	3	4	5	6
Type ↓ Regular				
Irregular				

	7	8	9	10
Sides→ Regular				
Irregular				101

100

ANSWER KEY

I. A. Whole numbers; Addition

I. A. 1. a) 2508
          b) 190,574
          c) 2,164,783
          d) 18
          e) 282
          f) 272

I. A. 2. a) 14   d) 294
          b) 14   e) 21
          c) 43   f) 136

I. B. Whole numbers; Subtraction

I. B. 1. a) 145   e) 612
          b) 25,247   f) 207
          c) 685,444   g) 549
          d) 3,293,697

I. B. 2. a) 3   d) 266
          b) 9   e) 1391
          c) 18   f) 22,484

I. C. Whole numbers; Multiplication

I. C. 1. a) 3182   e) 11,904
          b) 245,032   f) 61,380
          c) 3,300,990   g) 80
          d) 1,755   h) 2,232

I. C. 2. a) 35
          b) 72
          c) 988
          d) 33,333

I. D. Whole numbers; Division

I. D. 1. a) 7   f) 109

          b) 131   g) $11\frac{22}{23}$

          c) $172\frac{2}{5}$ h) $9\frac{346}{721}$

          d) 408   i) $153\frac{4}{226}$ or $153\frac{2}{113}$

          e) 173

I. D. 2. a) 8   d) 561
          b) 9   e) 362
          c) 8

I. E. Whole numbers; Order of operations

I. E. 1. a) 26
          b) 3
          c) 64
          d) 40
          e) 4

I. E. 2. a) 17
          b) 9½
          c) 2
          d) 28
          e) 32
          f) 18

_____

I. F. Whole numbers; Properties

I. F. a) Additive identity   i) Commutative of multiplication
       b) Commutative of addition   j) Associative of multiplication
       c) Closure of addition   k) Multiplicative identity
       d) Commutative of multiplication l) Associative of multiplication
       e) Associative of addition   m) Closure of multiplication
       f) Multiplicative identity   n) Associative of addition
       g) Commutative of addition   o) Additive identity
       h) Closure of multiplication   p) Associative of multiplication

_____

I. G. Whole numbers; Problem solving

I. G. 1. a) 2 ft. 6 in.
          b) 686 m
          c) 96 km

I. G. 2. a) 96 lb. 9 oz.
          b) 91 kg

I. G. 3. a) 3 gal. 1 qt.
          b) 18 1

_____

II. A. Decimals; Place value

II. A. 1. a) Three and forty-six hundredths
           b) Ten and one hundred one thousandths
           c) Seven and one hundred sixty-three millionths
           d) Two billion, four hundred sixty-three million,
               seven hundred twelve thousand, one hundred thirty-
               eight and four thousand one hundred seventy-eight
               ten thousandths.
           e) One hundred sixty-eight trillion, seven hundred nineteen
               billion, five hundred three million, four hundred twenty-
               five thousand, one hundred six and two hundred sixteen
               thousandths.

II. Decimals; Place value

II. A. 2. a) 3.005
           b) 1.0875
           c) 284.0015
           d) 10,000,142.9
           e) 5,008.000023

II. B. Decimals; Addition

II. B. 1. a) 1.2751
            b) 96.8558
            c) 22.0074
            d) 15.253
            e) 21.081259
            f) 23,469.68057

II. B. 2. a) 8.4
            b) 167.536
            c) 0.066169
            d) 5,238.8703

II. C. Decimals; Subtraction

II. C. 1. a) 1.451   d) 19.61506
            b) 1.079   e) 171.14
            c) 62.5716   f) 0.45762

II. C. 2. a) 0.9
            b) 1.03
            c) 5.777
            d) 6.541

II. D. Decimals; Multiplication

II. D. 1. a) 20.88
            b) 28.2348
            c) .00081
            d) .0036782

II. D. 2. a) 30.683
            b) .099
            c) 27.091806
            d) 2.7824
            e) .05412

II. E. Decimals; Division

II. E. 1. a) 0.8   d) 40
            b) 2.4   e) 0.003
            c) 75.9   f) 28,923.1

II. E.   Decimals; Division

II. E. 2.   a) 1.3   d) 15.038
              b) 40   e) 80
              c) 39.0425   f) 0.249

II. F. Decimals; Conversions

II. F. 1.   a) $\frac{4}{5}$ c) $\frac{1}{8}$

              b) $\frac{1}{2}$ d) $\frac{1}{4}$

II. F. 2.   a) $3\frac{2}{5}$ c) $10\frac{5}{8}$

              b) $2\frac{3}{4}$ d) $7\frac{1}{2}$

II. G.   Decimals; Order of operations

II. G. 1.   a) 5.924   d) 42.9414
              b) 11.045   e) 37.15632
              c) 2.5992

II. G. 2.   a) 8.3561   d) 2.764956
              b) 10.852   e) 6.0304272
              c) 1.17507

II. H.   Decimals; Ordering and comparing

II. H. 1.   a) <
              b) >
              c) >
              d) >
              e) <

II. H. 2.   a) .67, 6.07, 6.70
              b) .4067, .46, .467
              c) 6.030, 6.29, 6.3
              d) 37.72, 57.61, 57.62, 57.63
              e) 2.1349, 21.349, 213.49, 2134.9

II. I. Decimals; Problem solving

II. I.   a) $9.85
              b) $214.00
              c) $1.54
              d) $2.24
              e) liver; hamburger

III. A.   Number theory; Divisibility tests

III. A.   a)   (1) -4,280
             b)   (3) -5,655
             c)   (2) -1,008
             d)   (3) -625
             e)   (1) -726
             f)   (1) -396
             g)   (3) -4,280

III. B.   Number theory; Prime factors

III. B.   1.   Teacher graded.

III. B.   2.   a)   1, 2, 3, 4, 6, 8, 12, 24
                    Prime: 2, 3
                    Composite: 4, 6, 8, 12, 24

               b)   1, 2, 4, 13, 26, 52
                    Prime: 2, 13
                    Composite: 4, 26, 52

               c)   1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60
                    Prime: 2, 3, 5
                    Composite: 4, 6, 10, 12, 15, 20, 30, 60

               d)   1, 2, 3, 4, 6, 9, 12, 18, 36
                    Prime: 2, 3
                    Composite: 4, 6, 9, 12, 18, 36

III. B.   2.   e)   1, 2, 4, 5, 10, 20
                    Prime: 2, 5
                    Composite: 4, 10, 20

               f)   1. 2, 3, 6, 9, 18
                    Prime: 2, 3,
                    Composite: 6, 9, 18

III. C.   Number theory; Exponents

III. C.   4.   a)   81
               b)   1
               c)   8

III. C.   5.   a) y^2
               b) n^3
               c) x^4

III. F.   Number theory; Scientific notation

III. F.   1.   a) 3.4×10^2
               b) 5.6×10^3
               c) 1.27×10^1
               d) 6×10^6
               e) 8.47×10^5
               f) 5.9×10^0

III. F.   2.   a) 20,000
               b) 3,400,000
               c) 580
               d) 43.2
               e) 610,000
               f) 8,000,000,000

III. G.   Number theory; Order of operations

III. G.   1.   a) 23
               b) 10
               c) 13
               d) 4

III. G.   2.   a) 158
               b) 18
               c) 320

IV. A.   Fractions; Renaming fractions

IV. A.   a) 6   d) 42
               b) 28   e) 3
               c) 49   f) 7

IV. B.   Fractions; Multiplication

IV. B. 1. and 3.   a) $\frac{1}{6}$

                     b) $\frac{15}{28}$

                     c) $\frac{3}{5}$

                     d) $\frac{4}{9}$

IV. B. 2. and 3.   a) 9

                     b) $2\frac{1}{5}$ or $\frac{11}{5}$

                     c) $5\frac{1}{3}$ or $\frac{16}{3}$

                     d) $19\frac{1}{2}$ or $\frac{39}{2}$

                     e) $2\frac{1}{2}$ or $\frac{5}{2}$

91   108

IV. C. Fractions; Division

IV. C. 1.
a) $\frac{1}{2}$
b) 3
c) $\frac{2}{3}$
d) 9
e) $\frac{1}{a}$
f) c
g) $\frac{a}{b}$
h) $\frac{8}{3m}$

IV. C. 2.
a) $3\frac{1}{3}$ or $\frac{10}{3}$
b) $\frac{2}{3}$
c) $\frac{8}{15}$
d) $1\frac{1}{2}$ or $\frac{3}{2}$

IV. C. 3.
a) $\frac{1}{20}$
b) $1\frac{1}{2}$ or $\frac{3}{2}$
c) $2\frac{2}{3}$ or $\frac{8}{3}$
d) $\frac{14}{19}$
e) $\frac{8}{81}$

IV. D. Fractions; Addition

IV. D. 1.
a) $\frac{8}{9}$
b) $\frac{7}{8}$
c) $\frac{13}{17}$
d) $14\frac{2}{3}$
e) $4\frac{4}{5}$
f) $7\frac{4}{7}$

IV. D. 2.
a) $\frac{2}{3}$
b) $\frac{1}{2}$
c) 1
d) $\frac{3}{5}$

IV. D. Fractions; Addition

IV. D. 3. a) $\frac{3}{7}$

b) $1\frac{1}{2}$ or $\frac{3}{2}$

c) $1\frac{2}{15}$ or $\frac{17}{15}$

IV. D. 4. a) $1\frac{1}{2}$ or $\frac{3}{2}$

b) $9\frac{6}{11}$

c) $13\frac{1}{3}$

d) $6\frac{1}{12}$

IV. E. Fractions; Subtraction

IV. E. 1. a) $\frac{1}{3}$ d) $5\frac{3}{4}$

b) $\frac{2}{5}$

e) $1\frac{2}{3}$

c) $3\frac{1}{5}$

IV. E. Fractions; Subtraction

IV. E. a) $\frac{3}{4}$
2. and 3.

b) $\frac{3}{5}$

c) $\frac{5}{14}$

d) $1\frac{2}{3}$

e) $2\frac{1}{5}$

f) $1\frac{25}{36}$

IV. F. Fractions; Order of operations

IV. F. a) $\frac{1}{2}$ e) $2\frac{1}{24}$ or $\frac{49}{24}$
1. and 2.

b) $\frac{1}{2}$ f) $2\frac{1}{4}$ or $\frac{9}{4}$

c) $\frac{1}{8}$ g) $\frac{1}{36}$

d) 21   h) $6\frac{3}{4}$ or $\frac{27}{4}$

IV. G. Fractions; Fractional conversions

IV. G.	a) 0.6	(g) 1.25
1. and 2.	b) 0.7	(h) 3.2
	c) 0.48	(i) 2.$\overline{8}$
	d) 0.7$\overline{7}$	(j) 1.625
	e) 0.91$\overline{6}$	
	f) 1.625	

IV. H. Fractions; Ordering and comparing

IV. H. 1.
a) < d) = g) >
b) = e) = h) =
c) < f) < i) >

IV. H. 2.

a) $\frac{1}{2}, \frac{3}{5}, \frac{2}{3}$ d) $\frac{5}{28}, \frac{1}{4}, \frac{2}{7}$

b) $\frac{3}{8}, \frac{5}{12}, \frac{1}{2}, \frac{13}{24}$ e) $\frac{2}{3}, \frac{13}{18}, \frac{5}{6}, \frac{8}{9}$

c) $\frac{17}{42}, \frac{4}{7}, \frac{13}{21}, \frac{2}{3}, \frac{5}{6}$ f) $\frac{17}{30}, \frac{2}{3}, \frac{4}{5}, \frac{5}{6}, \frac{9}{10}$

IV. I. Fractions; Problem solving

IV. I.
a) $7.40
b) $103.50
c) $9.50

V. A. Ratio, proportion, percent; Ratio

V. A.

a) $\frac{3}{5}$

b) $\frac{10}{25}$ or $\frac{2}{5}$

c) $\frac{2}{12}$ or $\frac{1}{6}$

d) $\frac{11}{21}$

V. B. Ratio, proportion, percent; Proportion

V. B. 1.
a) yes c) no
b) yes d) no

V. B. 2.
a) means: 4,3
   extremes: 2,6
b) means: 8,16
   extremes: 6,24

V.   B.   Ratio, proportion, percent; Proportion

V.   B.   3.   a)   8
             b)   4

V.   C.   Ratio, proportion, percent; Percent

V.   C.   1.   a)   25%
             b)   20%
             c)   66 2/3%
             d)   150%
             e)   225%

V.   C.   2.   a)   .75
             b)   .52
             c)   .00403

V.   C.   3.   a) $\frac{3}{5}$

             b) $\frac{53}{100}$

             c) $\frac{11}{25}$

V.   C.   4.   a) $\frac{15}{25}$ = 60% increase

             b) $\frac{15}{40}$ = 37.5% decrease

             c) $\frac{12}{100}$ = 12% increase

             d) $\frac{110}{200}$ = 55% decrease

             e) $\frac{110}{90}$ = $122\frac{2}{9}$ % increase

V.   C.   5.   a)   0.008 = .8%
             b)   0.0025 = .25%
             c)   (1)   .125
                  (2)   .5
                  (3)   25

V.   C.   6.   Simple interest is defined by the following rule: Interest
               is equal to principal times rate times time.   R is expressed
               as a decimal; T is years that principal is borrowed.
               (I = P . R . T)

V. C.   Ratio, proportion, percent; Percent

V. C. 6.   Compound interest is the interest on principal, plus all
             previously computed interest. For compound interest, the
             principal P increases to the amount A by the following
             rule: $A = P (1+i)^n$, where

                 P is principal
                 i is rate per time period
                 n is the number of time periods, and
                 A is the amount after n periods of time

V. C. 7.   a) Salary is the amount of earned wages
             b) Commission is a percentage of the amount of a
                 sale paid as wages.

V. D. Ratio, proportion, percent; Problem solving

V. D. 1.   a) $800
           b) $105

V. D. 2.   a) $59.38
           b) $2.97
           c) $4.00
           d) 25%

VI. A.   Integers, rational numbers, real numbers; Definitions

VI. A.   1.   a) 1, 2, 3, 4, 6
               b) 6, 4
               c) 6, 4
               d) 6, 4, 3, 2, 1
               e) 6, 5
               f) 6, 5
               g) 6, 4, 3, 2, 1
               h) 6, 4

VI. B.   Number line; Construction

VI. B.   1.   a) -2
               b) 0
               c) 1

VI. B.   2.
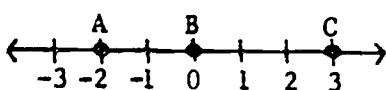
VI. D. Number line; Graphs of subsets

VI. D. a)
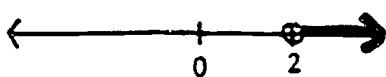
VI. D. b)
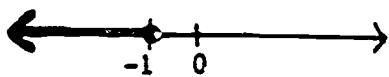
VI. D. c)
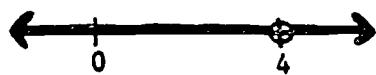
VI. E. Number line; Absolute value

VI. E. a) Absolute value: the number of units a number
is from zero on a number line.

b) (1) 2
(2) 0
(3) 4
(4) $\frac{1}{2}$

VI. F. Integers, rational numbers, and real numbers; Operations

VI. F.   1. a) 5   2. a) $1\frac{1}{4}$ or $\frac{5}{4}$ q) 16.05
1. and 2.
             b) −1   b) $\frac{7}{24}$ r) 3.741

             c) 2   c) $2\frac{5}{6}$ or $\frac{17}{6}$ s) −13.244

             d) −8   d) $-15\frac{5}{6}$ t) −17.78

             e) 2   e) $\frac{1}{6}$ u) 1.43

             f) −11   f) $-\frac{11}{18}$ v) −1.78

             g) 11   g) $6\frac{3}{20}$ w) 38.35

             h) 2   h) $-3\frac{1}{2}$ x) −3.8

             i) 30   i) $\frac{1}{6}$ y) 14.911

             j) −21   j) $-\frac{5}{21}$ z) −0.081

             k) −54   k) −1   aa) −0.07

             1) 32   1) $1\frac{1}{2}$ or $\frac{3}{2}$ bb) 0.03475

             m) 3   m) $1\frac{1}{3}$ or $\frac{4}{3}$ cc) 40

             n) −2   n) −3   dd) −15.8

             o) −8   o) $-\frac{1}{6}$ ee) −541

             p) 5   p) $\frac{1}{5}$ ff) 520

VI. G. Integers, rational numbers, and real numbers; Order of operations

VI. G.   a) 4.6
          b) −39.1

VI. H. Integers, rational numbers, and real numbers; Properties

VI. H.   a) (8)   g) (6)
          b) (10)   h) (2)
          c) (5)   i) (9)
          d) (1)   j) (4)
          e) (11)   k) (7)
          f) (3)

VI. I. Integers, rational numbers, and real numbers; Problem solving

VI. I.   a) 3(−5) = −15
          b) 6(−10.6) = −63.6
          c) $(3\frac{1}{2})$(2.75) = 9.625 or $9.63

VII. Elementary algebra

VII. A. 1. a) 50   e) 37
           b) 3   f) $\frac{1}{2}$
           c) 19   g) −1.18
           d) 81

VII. A. 2. a) B = {8, 10, 12}   d) B = {23 $\frac{1}{3}$, 29 $\frac{1}{3}$, 35 $\frac{1}{3}$ }

           b) B = {40, 50, 60}   e) B = {240, 340, 456}

           c) B = {6, 7, 8}

VII. Elementary algebra

VII. B. 1. a) (1) f
               (2) d
               (3) b
               (4) a
               (5) e
               (6) c

VII. B. 1. b) and c)

               (1) like   (6) like
               (2) unlike   (7) unlike
               (3) like   (8) like
               (4) unlike   (9) unlike
               (5) like   (10) like

VII. B. 1. d) (1) 8x   (14) $\frac{a+b}{c}$
               (2) 8mn
               (3) $20a^2b$ (15) $\frac{5a}{5}$
               (4) −5m
               (5) 2m   (16) $\frac{9}{a}$
               (6) $-5.3y^2$
               (7) 6x + 1y + 8z   (17) $\frac{11}{15a}$
               (8) 2c − 2$\frac{1}{2}$f
               (9) $4x^2 + 3$ (18) $\frac{ad+cb}{bd}$
              (10) $-6bx + b^2x + 6$
                    or $b^2x − 6bx + 6$ (19) $\frac{11c}{9}$
              (11) 6x + 6y
              (12) 9a − 3b   (20) $\frac{6}{b}$
              (13) $-3x^2 − 15x − 21$
                                               (21) $\frac{1a}{n}$

                                               (22) $\frac{2c}{9}$

                                               (23) $\frac{3r}{10}$

                                               (24) $\frac{1c}{2}$

                                               (25) $\frac{11c}{36}$

VII. Elementary algebra

VII. B. 2.
1) $6b$
2) $.35c^2$
3) $-8xy$
4) $3t^3$
5) $-60abc$
6) $-3u^2y^4$
7) $-72c^3d^2$
8) $-6r^{10}s^6$
9) $-56txz$
10) $-6bc$

11) $\dfrac{8}{a}$
12) $\dfrac{7n}{13}$
13) $\dfrac{22m}{21}$
14) $\dfrac{5c}{6}$
15) $\dfrac{34}{15m}$
16) $\dfrac{2}{3a}$
17) $\dfrac{1}{3}$
18) $\dfrac{1}{4}$
19) $\dfrac{2}{3}$
20) $\dfrac{5ab}{8}$

VII. B. 3.
1) $12c + 6d$
2) $20b - 2f$
3) $-8x^2 + 20x$
4) $-18c^2 + 12c^3$
5) $m^2n + mn^2$
6) $3d^3 - 6d^2 + 12d$
7) $-8a - 14b$
8) $21a^3b^2 - 14a^3b^3$
9) $6f \div 9g$
10) $-36e + 18e^2 + 54e^3$

VII. B. 4.
1) x^3
2) t^8
3) e^5
4) $z^0 = 1$
5) $3^3 = 27$
6) n^2
7) $2^3 = 8$
8) $x^{5a-2a} = x^{3a}$
9) S^{x-2}
10) $-5x^3$

11) $\dfrac{1}{5}$
12) $\dfrac{1}{3m}$
13) $\dfrac{17}{c}$
14) $\dfrac{33c}{4}$
15) $\dfrac{125}{6m}$
16) $\dfrac{b}{a}$
17) a^2
18) $\dfrac{3}{5}$
19) $\dfrac{a}{3}$
20) $\dfrac{5}{2}$

21) $4a^2b^4c^5$

VIII. Linear equations and inequalities of one variable

VIII. A.
a) reflexive
b) transitive
c) symmetric
d) transitive
e) reflexive
f) symmetric

VIII. B. 1.
a) 3
b) -17
c) 8
d) 7
e) -3
f) 47
g) 8
h) -7
i) -27
j) 24
k) -18
l) -252
2. m) 5
n) 1
o) 24
p) 4
q) 2
r) -3
s) 1
t) -5

VIII. C. Linear equations; Graphing

VIII. C. 1.
a) axis, horizontal   d) quadrant, 1st   g) quadrant, 4th
b) quadrant, 2nd   e) axis, vertical   h) quadrant, 3rd
c) axis, horizontal   f) axis, vertical   i) axis, both

VIII. C. 2.   a)

$2x + y = 4$
$y = -2 + 4$

x	y
0	4
2	0
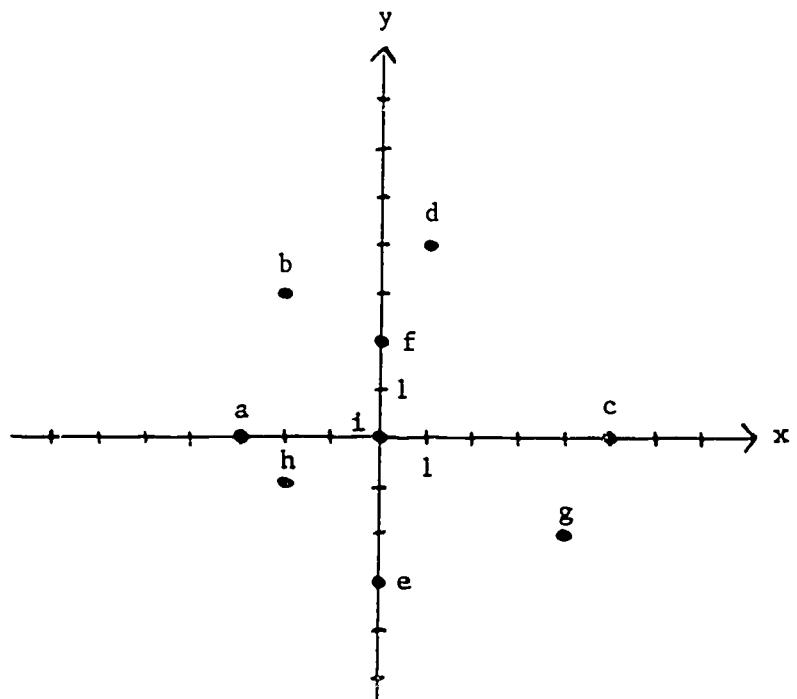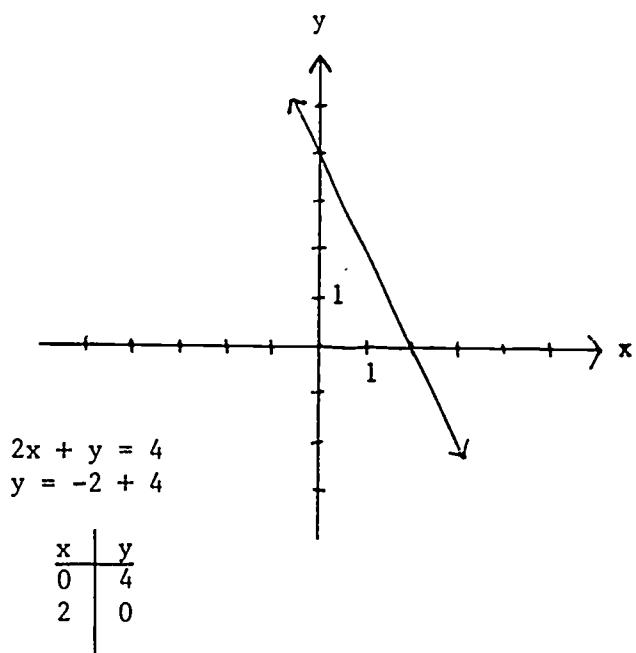
VIII. C. Linear equations; Graphing

VIII. C. 2. b)
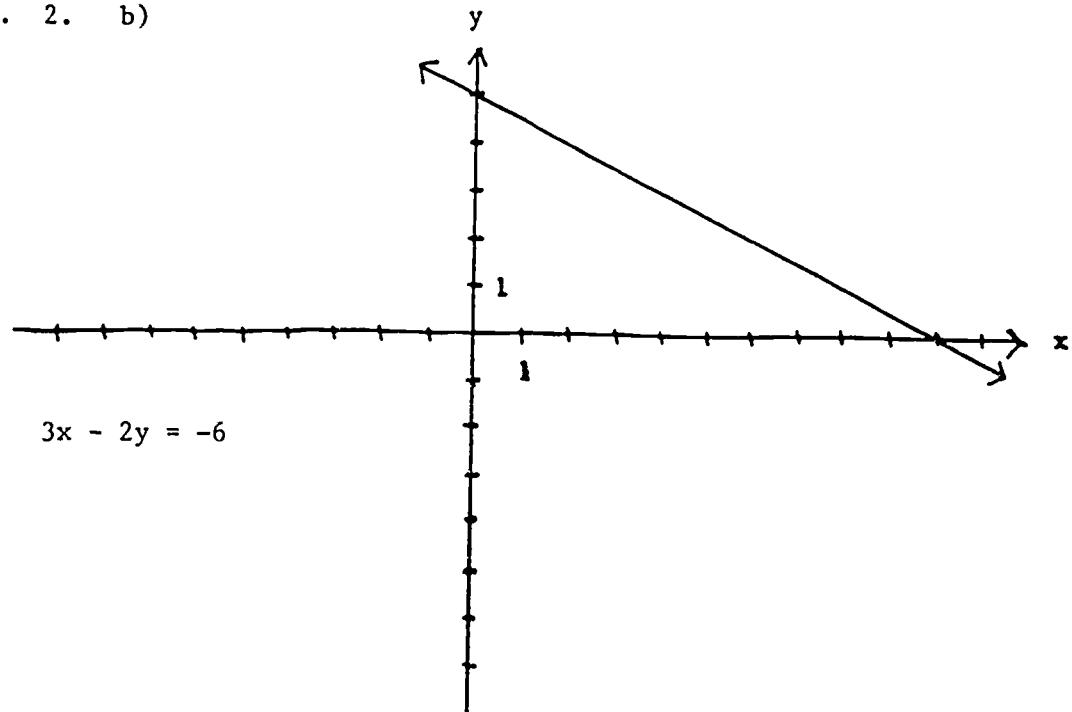
$3x - 2y = -6$

VIII. C. 2. c)
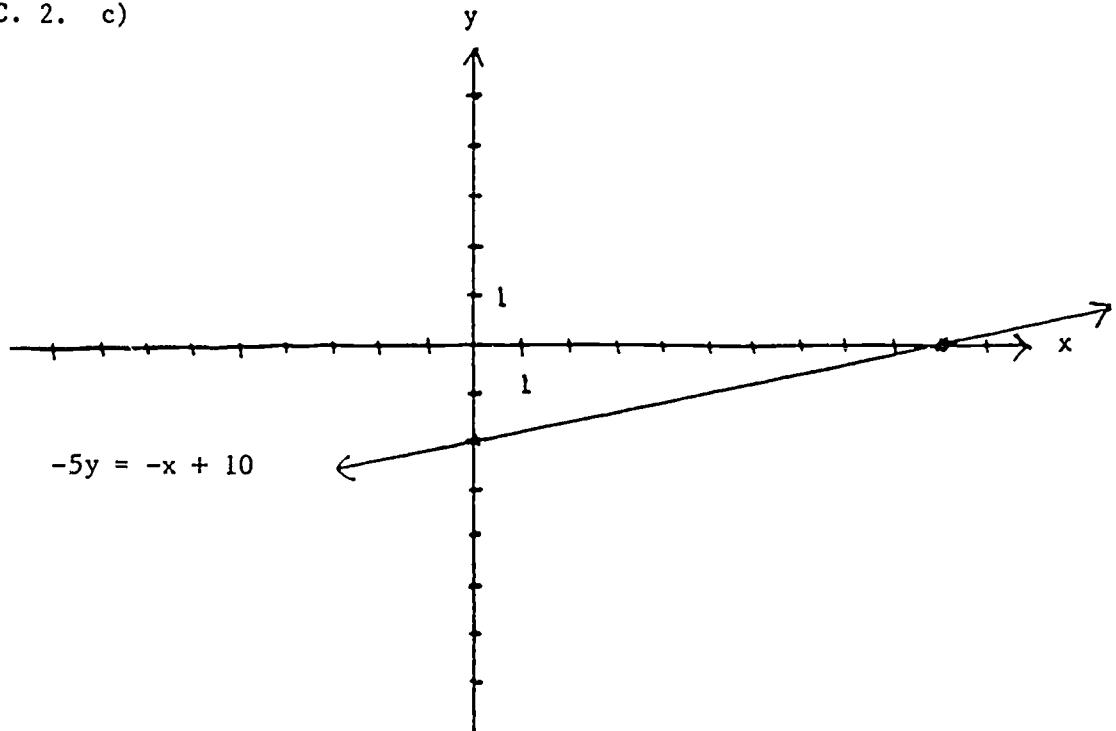
$-5y = -x + 10$

VIII. C. Linear equations; Graphing

VIII. C. 2. d)

$$y = -2$$

VIII. C. 2. e)

$$x = 3$$
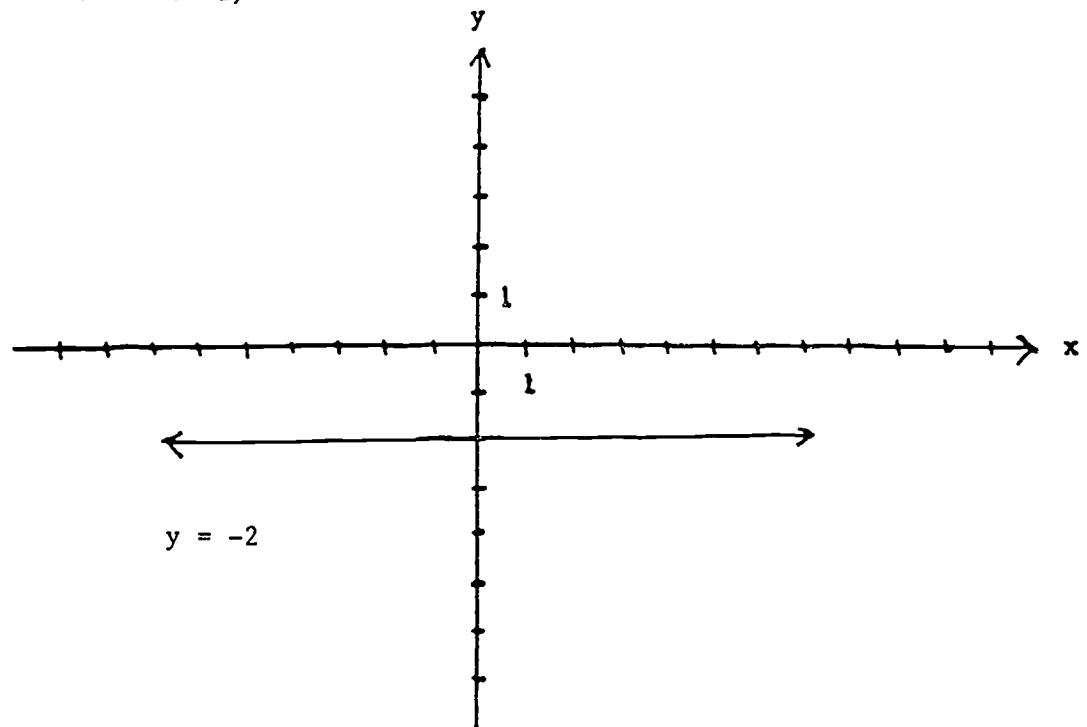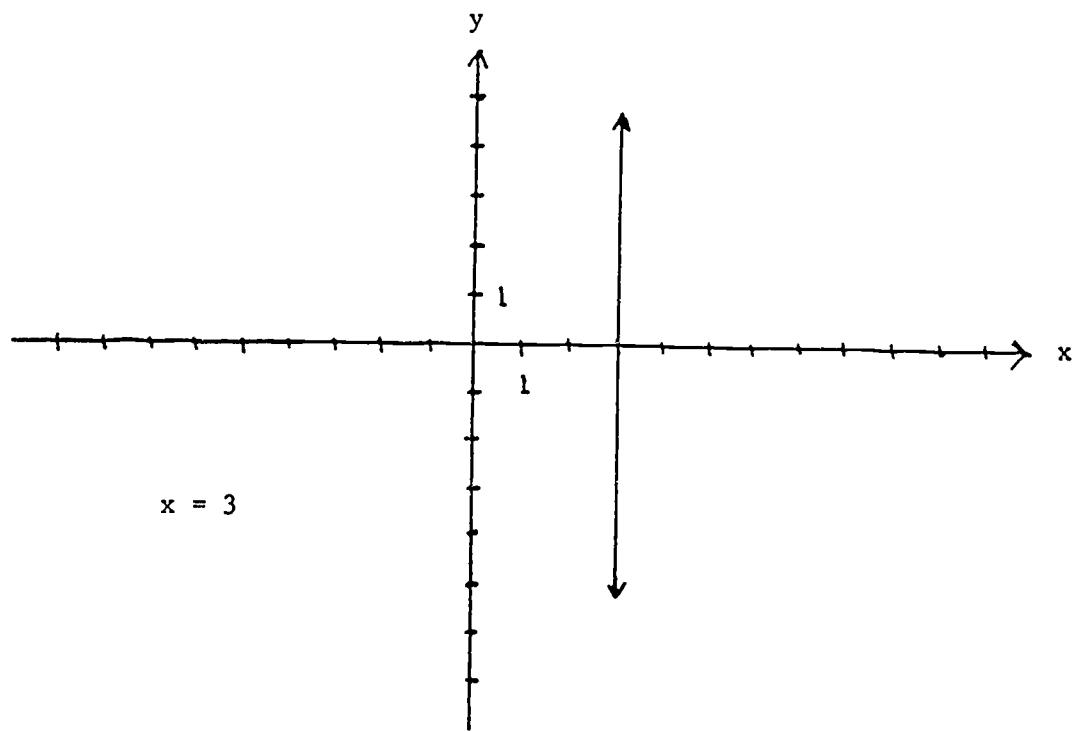
VIII.   D.   Linear equations; Problem solving

VIII.   D.   1.   a)   (1)   b + 8 or 8 + b
                    (2)   x - y
                    (3)   mn
                    (4)   12 + 8 or 8 + 12
                    (5)   t - 5
                    (6)   2c + 3 or c + 2c
                    (7)   4m - 6
                    (8)   7-(2 + x) or 7-(x + 2)
                    (9)   5(2+y) or 5(y+2)
                   (10)   (3x)²
                   (11)   (3+x)² or (x+3)²

VIII.   D.   1.   b)   (1)   Five more than a number
                    (2)   x less than three
                    (3)   The sum of a and b
                    (4)   Three less than five times a number

VIII.   D.   2.   a)   (1) $2x + 16 = 86$
                           The number is 35.

                    (2) $3n - 17 = 43$
                           The number is 20.

             b)   (1) $x + (x+1) = 35$
                           The integers are 17 and 18.

                    (2) $x + (x+2) + (x+4) = 105$
                           The integers are 33, 35, and 37.

                    (3) $4(x+4) - 5x = 26$
                           The integers are 10, 12, and 14.

             c)   (1) $2(2w+3) + 2w = 30$
                           The width is 4 cm and the length is 11 cm.

                    (2) $x + (2x+3) + (4x-2) = 22$
                           The lengths of the sides are 3 cm, 9 cm,
                           and 10 cm.

             d)   (1) $50t + 60t = 660$
                           The time is 6 hours.

                    (2) $3x + 4(x+15) = 375$
                           The rate of the bus is 45 mi/hr and that
                           of the train is 60 mi/hr.

             e)   (1) $.1(q+4) + .25(q) = 2.15$
                           She has 9 dimes.

                    (2) $.05(q-24) + .1(q+17) + .25q = 21.3$
                           There are 28 nickels.

VIII.   D.   Linear equations; Problem solving

VIII.   D.   2.   f) (1)   x + (2x+3) = 39
                           Emma is 12 years of age and Bob is 27.

             (2)   4x + 5 = 3(x+5)
                   Jack is 10 years of age.

VIII.   E.   Linear equations and inequalities of one variable

VIII.   E.   1)   x ≥ 3

2)   x > 3
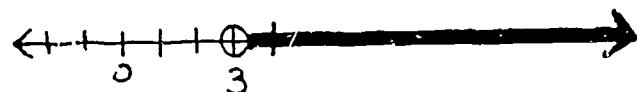
3)   x < 19
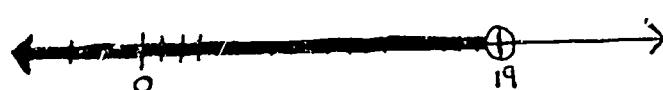
4)   x > 5

5)   x ≤ -8
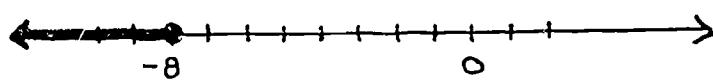
6)   x ≤ 5
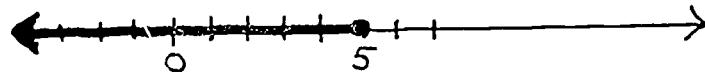
7)   x > -4
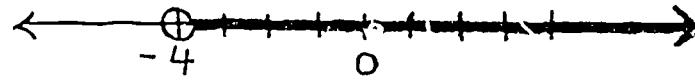
8)   x > -4

VIII. E. Linear equations and inequalities of one ariable

9) $x \le 4$

10) $x \ge \frac{7}{2}$ or

   $x \ge 3\frac{1}{2}$
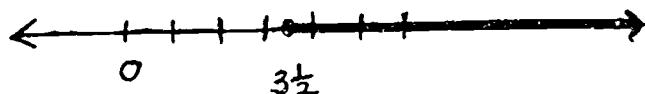
11) $x \ge 2\frac{1}{2}$
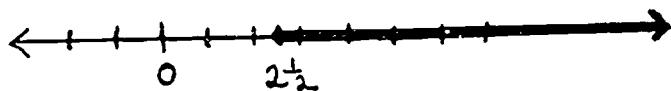
12) $x \le 3\frac{1}{2}$
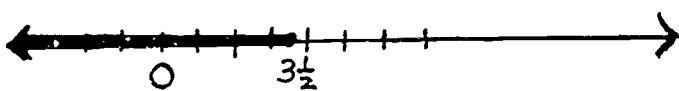
13) $x < 6\frac{1}{2}$
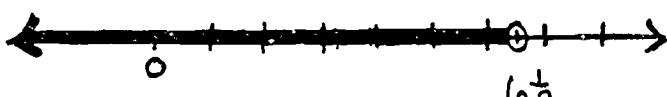
14) $x \ge -2\frac{3}{4}$

15) $x < -\frac{7}{3}$ or

   $x < -2\frac{1}{3}$
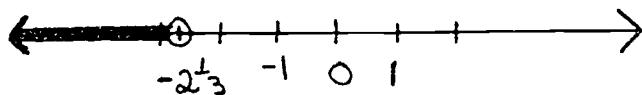
IX. Probability and statistics; Graphs

IX. A.   a) (1)   15,965,000
1. and 2.   (2)   29.75% or 29.8%

b) (1)

Number of Hours a Week Spent Studying

```
0 ─────────────────────────────────────
5 ┤   ┌─┐
4 ┤   │ │                   ┌─┐
3 ┤   │ │    ┌─┐            │ │
2 ┤   │ │    │ │    ┌─┐    │ │    ┌─┐
1 ┤   │ │    │ │    │ │    │ │    │ │
  └───┴─┴────┴─┴────┴─┴────┴─┴────┴─┴──
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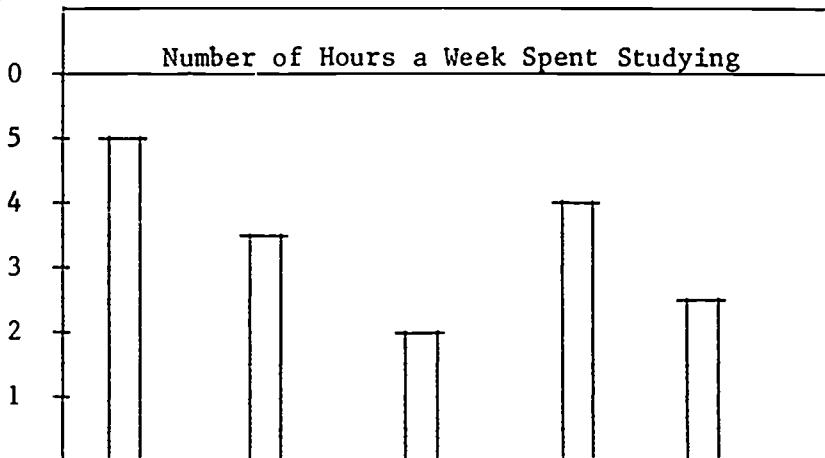
SUBJECTS

IX.   A. 1. and 2.
b) (2)

Projected Number of Car Sales in 1995

Isuzu	θθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθ
BMW	θθθθθθθθθθθθθθθθ
KIND Peugeot	θθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθ
OF Escort	θθθθθθθθθθθθθθθθθθθθθθθθθθθθθ
CAR Yugo	θθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθθ

θ = 10,000 cars

(3)   Number of Students Enrolled

```
NUMBER     500 ┼
  OF       450 ┼
STUDENTS   400 ┼
           350 ┼
           300 ┼
           250 ┼
           200 ┼
                └──┬────┬────┬────┬──
                   9   10   11   12
```

__ Vo Tech
-- Magnet High   GRADE
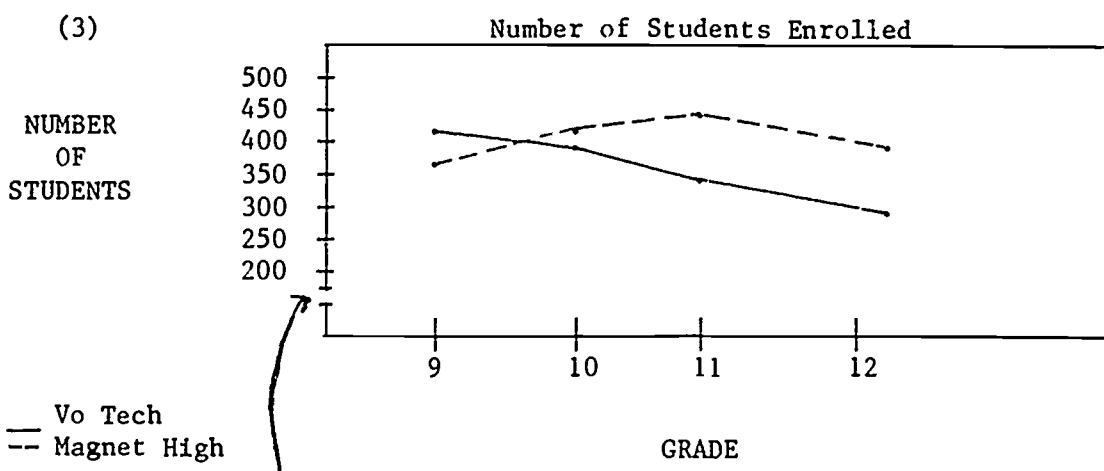
This shows that part of the scale is not included.

IX. Probability and statistics; Graphs

IX. A. 1. and 2. c) (1) 33%
                       (2) 2%
                       (3) 310

                  d) (1) Lawyers
                     (2) Teachers and nurses
                     (3) $5000

IX. B. Probability and statistics; Probability

IX. B.   a) (1) yes
1. and 2.   (2) P(Heads) = .5 or $\frac{1}{2}$
                        (3) P(Tails) = .5 or $\frac{1}{2}$

                     b) (1) yes
                        (2) P(1) = $\frac{1}{3}$

                        (3) P(2) = $\frac{1}{3}$

                        (4) P(3) = $\frac{1}{3}$

                     c) (1) $\frac{1}{6}$

                        (2) $\frac{1}{6}$

                        (3) $\frac{1}{6}$

                     d) (1) $\frac{5}{11}$

                        (2) $\frac{4}{11}$

                        (3) $\frac{2}{11}$

IX. C. a) Mean: 30.5
             Mode: 36
             Median: 31
             Range: 12

         b) Mean: 19.25
             Mode: 9.4
             Median: 9.4
             Range: .9

         c) Mean: 88
             Mode: 92
             Median: 86
             Range: 9

IX. Probability and statistics; Statistics

IX. D. a) 62,612
        b) 13.5
        c) (1) mean   (3) mode
           (2) median   (4) range

        d) (1) 100,455
           (2) 35,150
           (3) 12,580

        e) (1) P(Black) = $\frac{50}{100}$ = $\frac{1}{2}$ = 50%

           (2) P(Black or white) = $\frac{50}{100}$ + $\frac{30}{100}$ = $\frac{80}{100}$ = $\frac{4}{5}$ = 80%

           (3) P(Blue) = $\frac{20}{100}$ = $\frac{1}{5}$ = 20%

X. Geometry

X. A. 1. a) A pencil point
          b) Where walls meet the floor
          c) A page in a book

X. A. 2. a)

E   D   C

          b)

R   S

X. E. 6. a) yes   c) no

          b) no   d) yes

X. Geometry; Quadrilaterals

X. F. 3. a) 15 cm² (A=$\frac{1}{2}$h(b$_1$+b$_2$))

          b) 25 cm² (A = s²)

          c) 48 m² (A = bh)

          d) 12m² (A = lw)

X. H.   Geometry; Problem solving

X. H.   1.   a)   cylinder = $58,875m^3$ $(V = \pi r^2 h)$

cone = $19,625m^3$ $(V = \frac{1}{3} \pi r^2 h)$

b)   pyramid = $213.3m^3$ $(V = \frac{1}{3} s^2 h)$

c) $145,595.52$ in.^{3} $(V = \frac{4}{3} \pi r^3)$

d)   cube = 512 cm^3 $(V = s^3)$
rectangular solid = 160 cm^3 $(V = lwh)$

X. H.   2.   a) $14,520$ yd.^{2}
b) 4.1332 m^2